



FEED THE FUTURE ETHIOPIA VALUE CHAIN ACTIVITY

**USAID TASK ORDER AID #663-C-17-00001**

**PESTICIDE EVALUATION REPORT AND SAFER USE ACTION PLAN  
(PERSUAP)**

**Submitted October 20, 2017**

Submitted by Fintrac Inc. to Contracting Officer's Representative Mr. Bryan Byrne, USAID Ethiopia

FEED THE FUTURE ETHIOPIA VALUE CHAIN ACTIVITY

**PESTICIDE EVALUATION REPORT AND SAFER USE ACTION PLAN (PERSUAP)**  
**NOVEMBER 30, 2017**

**DISCLAMER**

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

**Approval Face sheet**

**INITIAL ENVIRONMENTAL EXAMINATION, Amendment 1  
Feed the Future Ethiopia Value Chain Activity (FTFE VCA)  
United States Agency for International Development Mission to Ethiopia (USAID/Ethiopia)**

**A. PROGRAM AND ACTIVITY DATA**

**PROJECT NAME:** FTFE VCA

**ASSISTANCE OBJECTIVE:** Improve agriculture productivity and commercialization of smallholder farmers in Ethiopia.

**PROGRAM AREA:** 4.5 Agriculture, Feed the Future

**COUNTRY:** Ethiopia

**ORIGINATING OFFICE** Office of Economic Growth and Transformation (EG&T)

**CURRENT DATE:** November 30, 2017

**IEE AMENDMENT:** Yes ☒ No ☐ The purpose of this IEE amendment is to approve the 2017 Pesticide Evaluation Report (PER) and Safer Use Action Plan (SUAP) developed under the FTFE VCA project and which will be used during project implementation.

**DCN OF ORIGINAL IEE:** 2012

**IMPLEMENTATION START:** January 1, 2017  
**IMPLEMENTATION END:** December 31, 2021

**LOP AMOUNT:** \$60,229,208

**Environmental Media and/or Human Health Potentially Impacted:**

None ☐ Air ☐ Water ☒ Land ☒ Biodiversity ☒ Human health ☒ Other ☐

**IEE Amendment (Y/N):** N

**Filename & date of original IEE:**

**ENVIRONMENTAL ACTION RECOMMENDED:** (Place X where applicable)

Categorical Exclusion: \_\_\_\_\_ Negative Determination with condition: **X** \_\_\_\_\_  
Positive Determination: \_\_\_\_\_ Deferral: \_\_\_\_\_

**ADDITIONAL ELEMENTS:** (Place X where applicable)

CONDITIONS: **X** \_\_\_\_\_ PVO/NGO: \_\_\_\_\_

## **B. BACKGROUND:**

The purpose of this IEE Amendment is to present and approve the 2017 FTFE VCA Pesticide Evaluation Report (PER) and Safer Use and Action Plan (SUAP) recommended to be done in the FTFE VCA's Environmental Mitigation and Monitoring Plan (EMMP), which was approved by USAID/Ethiopia on April 9, 2017. FTFE VCA staff members have presented for analyses a list of pesticides that they would like to promote to their beneficiaries. It is this proposed list of pesticides—and the pests they are to be used against—that is analyzed in this FTFE VCA PERSUAP. As USAID desires, the PERSUAP also focuses on, researches and analyzes preventive IPM tools and techniques useful for each pest.

*USAID/Ethiopia Agriculture Value Chain and Private Sector Project IEE, Prepared by Yitayew Abebe for Functional Objective: 4.0 Economic Growth; Program Area: 4.5 Agriculture and 4.8 Environment; Program Elements: 4.5.1 Agriculture Enabling Environment, 4.5.2 Agriculture Sector Capacity, 4.8.1 Natural Resources Biodiversity, 4.8.2 Clean Productive Environment. Period Covered: 2015-2020; Expiration Date: December 30, 2020* covers this Feed the Future program under the Economic Growth and Transformation Development Objective (DO 1). This IEE is USAID's controlling environmental compliance document, and it recommended that PERSUAPs, like this one, be produced for any activities potentially involving pesticides. For pesticides the IEE made a *Negative Determination with Conditions*, which means that a full Environmental Assessment would not be needed, with the following Conditions:

“The DO 1 team shall ensure that any activity involving pesticides, or new pest management products or technologies will be preceded by the preparation and BEO approval of PERSUAPs in accordance with Agency guidance, and fulfilling all analytical elements required by 22CFR216.3 (b), USAID's Pesticide Procedures. The USAID/EA environmental staff will assist the Ethiopia MEO and Activity Managers in establishing the need. New PERSUAPs will be commissioned as necessary, by the respective implementing partners.”

This 2017 FTFE VCA PERSUAP addresses this need. Due to the risk concerns presented by pesticides, USAID's environmental regulations require that all programs that include assistance for the promotion, procurement (directly or through financial instruments) or use of pesticides must assess risks associated with this assistance following the Pesticide Procedures described in 22 CFR (Regulation) 216.3. At least 12 factors must be addressed according to Regulation 216.3 (b)(1)(i) (a through l). These 12 factors are normally examined in a technical analysis document called a “Pesticide Evaluation Report and Safer Use Action Plan” (PERSUAP).

FTFE VCA is a \$60.22 million USAID-funded program that integrates agricultural, gender and nutritional development approaches to improve smallholder farmers' productivity and profitability in maize, coffee, chickpea, dairy, livestock and poultry value chains. Fintrac's team in partnership with the Government of Ethiopia's Agricultural Growth Program (AGP II) will lead this activity which is part of USAID's USAID/Ethiopia Agriculture Value Chain and Private Sector (AVC & PS) project under Development Objective 1, Increased Growth with Resiliency in Rural Ethiopia.

## **C. COUNTRY AND ENVIRONMENTAL BASELINE INFORMATION**

Ethiopia is a country of more than 1.1 million km<sup>2</sup>, with a projected population of 84 million in 2012. Agriculture is the most important enterprise, providing employment for more than 7 percent of the country's population. It accounted for about 41 percent of the total GDP and 90 percent of export earnings in 2011.

## **D. EVALUATION OF ACTIVITY WITH RESPECT TO POTENTIAL ENVIRONMENTAL IMPACTS AND IDENTIFICATION OF MITIGATION MEASURES**

All activities approved in the original IEE remain valid. This proposed IEE amendment for FTFE VCA will assist with the following additional activities towards current objectives:

- Produce the 2017 FTFE VCA PERSUAP to cover any and all activities related to pesticide training, promotion, or use on supported beneficiary farms that produce project crops or crop and livestock products.

## **E. RECOMMENDED ENVIRONMENTAL ACTION**

### **1. Recommended Environmental Threshold Determinations:**

A Negative Determination with Conditions was recommended for activities that are related to pesticide training, promotion, distribution and use, directly or through other financial instruments (credit, sub grants, vouchers) under this amendment pursuant to 22 CFR 216.3(a)(2)(iii).

### **2. Conditions**

Implementation of the following recommendations of Good Agriculture Practices from the PERSUAP are conditions for any assistance to farmers that might include training on, discussing or promotion of the use of pesticide inputs.

- **Condition 1:** A list of products that were considered but rejected in this PERSUAP is presented in Attachment 1. These products may not be demonstrated or promoted by FTFE VCA (Based on April 2017 MoANR list of Pesticides Registered in Ethiopia, October 2013 Former DACA, now VDAFACA list of Household Pesticides, and USEPA Registration Status).
- **Condition 2:** Only pesticide products Accepted/Approved by this PERSUAP, as presented in Attachments 2 and 3, will be considered for assistance for target commodities of FTFE VCA.
- **Condition 3:** FTFE VCA will work and build on the work of the Commercial Farmers Service Project (CFSP). Each Commercial Farm Service Center (CFSC) and agro-input dealers supported by the activity will acquire, have at their sales offices, and use Material Safety Data Sheets (MSDS) for each approved pesticide.
- **Condition 4:** FTFE VCA will perform repeated integrated pest management, safer pesticide use, and record keeping training for all implementers and beneficiaries that promote, procure, or use pesticides with project assistance.
- **Condition 5:** FTFE VCA will conduct a pesticide safer use and recordkeeping training for program supported agronomists, veterinarians, and any activity staff that will be engaged in pesticide handling.
- **Condition 6:** FTFE VCA shall ensure farmers and clients that purchase pesticides from activity supported input suppliers (CFSCs and agro-input dealers) will receive in-house consultations and product specific information on how to use the pesticide, safety equipment, dosage, storage, and disposal of empty container, and other important safety considerations.
- **Condition 7:** FTFE VCA will annually check the MoANR and US EPA registration status of pesticides approved in this PERSUAP for changes of special concern to assure that the pesticides offered by activity supported input suppliers and agro input dealers are concurrent with the MoANR and US EPA list.
- **Condition 8:** FTFE VCA staff will regularly monitor the efficacy of pesticides used by farmers to note any reduction in efficacy and likely occurrence of pest resistance.
- **Condition 9:** If FTFE VCA wishes to provide assistance for the procurement or use of pesticides not included in the approved pesticide list, FTFE VCA shall submit an amendment to the IEE/PERSUAP requesting BEO approval of the additional pesticide(s).
- **Condition 10:** FTFE VCA will uphold the directive that any person who imports pesticides or sells pesticides shall be responsible for the disposal of any obsolete pesticide in his/her custody at own expenses. No person shall dispose of any pesticide or pesticide waste contravening the rules and regulations of the GoE and in a manner that may harm people, animals or the environment.

- **Condition 11:** For all demonstrations, FTFE VCA implementers shall introduce pest and pesticide record-keeping concepts and tools following the appropriate best management practices.

**ADDITIONAL PESTICIDE SECTOR PROGRAMMATIC RECOMMENDATIONS (if resources are, or become, available)**

<b>Actions Recommended</b>
For all demonstrations, FTFE VCA project implementers introduce pest and pesticide record-keeping concepts and tools following GLOBALGAP or other internationally accepted Best Management Practices (BMPs).

<b>Program Management Actions on Compliance</b>
FTFE VCA will monitor beneficiary farmers for their understanding and use of best practices and IPM tools and tactics.
FTFE VCA implementers will report on any changes in Ethiopia pesticide regulations and registrations to USAID.

**F. MANDATORY INCLUSION OF ENVIRONMENTAL COMPLIANCE REQUIREMENTS IN SOLICITATIONS, AWARDS, BUDGETS AND WORKPLANS**

1. Appropriate environmental compliance language shall be included in solicitations and awards for this activity with an appropriate level of funding and staffing to satisfy the environmental compliance requirements set forth in this IEE Amendment.
2. The implementing partner will incorporate conditions set forth in this IEE in to their work plans.

**G. LIMITATIONS OF THE IEE**

Generally this IEE Amendment does not cover major activities involving:

1. Classes of substantial actions normally having a significant effect on the environment pursuant to 22CFR 216.2(d)(1):
  - i. Programs of river basin development;
  - ii. Irrigation and water management;
  - iii. Agricultural land leveling;
  - iv. Drainage projects;
  - v. Large scale agricultural mechanization;
  - vi. Resettlement projects;
  - vii. New land development;
  - viii. Penetration road building and road improvement;
  - ix. Power plants;
  - x. Industrial plants;
  - xi. Potable water and sewerage projects;
2. Activities affecting endangered species or introducing exotic species.
3. Support to extractive industries (e.g. mining and quarrying).
4. Support for activities that promote timber harvesting.
5. Construction, reconstruction, rehabilitation, or renovation work.
6. Activities involving support to agro-processing, industrial enterprises, and regulatory permitting institutions.
7. Activities involving support to industrial enterprises, and regulatory permitting.
8. Potential activity components dealing with privatization of industrial facilities or infrastructure with heavily polluted property.
9. Project preparation, project feasibility studies, and infrastructure investments for projects that may have a potentially significant impact on the environment.
10. Procurement or use of genetically modified organisms (GMOs).

11. DCA or GDA programs.

Any of the above actions would require another amendment to the IEE approved by the BEO.

#### H. REVISIONS:

Pursuant to 22 CFR 216.3(a) (9), if new information becomes available that indicates that activities covered by the IEE might be considered "major" and their effect "significant," or if additional activities are proposed that might be considered "major" and their effect "significant," this Initial Environmental Examination will be reviewed and, revised by the MEO with concurrence by the BEO. It is the responsibility of the USAID COR to keep the MEO, REA and BEO informed of any new information or changes in the activity that might require revision of the IEE.

#### APPROVAL OF THE RECOMMENDED ENVIRONMENTAL ACTION:

11. DCA or GDA programs.  
Any of the above actions would require another amendment to the IEE approved by the BEO.

**H. REVISIONS:**  
Pursuant to 22 CFR 216.3(a) (9), if new information becomes available that indicates that activities covered by the IEE might be considered "major" and their effect "significant," or if additional activities are proposed that might be considered "major" and their effect "significant," this Initial Environmental Examination will be reviewed and, revised by the MEO with concurrence by the BEO. It is the responsibility of the USAID COR to keep the MEO, REA and BEO informed of any new information or changes in the activity that might require revision of the IEE.

**APPROVAL OF THE RECOMMENDED ENVIRONMENTAL ACTION:**

**APPROVAL:**  
Mission Director, USAID Ethiopia: [Signature] Date: 21 Feb 18  
Leslie Reed

**CONCURRENCE:**  
Bureau Environmental Officer: Brian Hirsch Date: \_\_\_\_\_

**File #:** \_\_\_\_\_

**ADDITIONAL CLEARANCES:**

EG&T Office Chief: [Signature] Date: 1-29-18  
Stephen Morin

COR, USAID/Ethiopia: [Signature] Date: 1-26-18  
Brynn Byrne

MEO, USAID/Ethiopia: [Signature] Date: Jan 29-18  
Yitayew Abebe

Regional Environmental Officer: [Signature] Date: Jan 4, 2018  
East Africa David Kiryas

RLA: [Signature] Date: 2/13/18  
Muriel Korol







# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



## **Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)**

### **Feed the Future Ethiopia Value Chain Activity**

*Partnering with the Agricultural Growth Program*

**October 2017**

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## ACRONYM LIST

AI	Active Ingredient
ATA	Agricultural Transformation Agency
AGP	Agricultural Growth Program
CFR	Code of Federal Regulations
CFSC	Commercial Farmers Service Center
CFSP	Commercial Farmers Service Project
COP	Chief of Party
COR	Contracting Officer's Representative
DCA	Development Credit Authority
EMMP	Environmental Mitigation & Monitoring Plan
EMMR	Environmental Mitigation & Monitoring Report
ERR	Environmental Review Report
ESF	Environmental Screening Form
FCU	Farmer Cooperative Union
FTF	Feed the Future
FTFE VCA	Feed the Future Ethiopia Value Chain Activity
FY	Financial Year
GAPs	Good Agricultural Practices
GHP	Good Husbandry Practices
GoE	Government of Ethiopia
GMO	Genetically Modified Organism
GUC	Grants under Contract
IEE	Initial Environmental Examination
IPM	Integrated Pest Management
LMO	Living Modified Organism
MEO	Mission Environmental Officer
MoANR	Ministry of Agriculture and Natural Resources
MoLF	Ministry of Livestock and Fisheries
MoT	Ministry of Trade
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
SOW	Statement of Work
USAID	United States Agency for International Development
USEPA	United States Environmental Protection Agency
USG	United States Government
VDAFACA	Veterinary Drugs and Animal Feed Administration and Control Authority
WASH	Water and Sanitation for Health
WHO	World Health Organization

## BACKGROUND

USAID's Feed the Future Ethiopia Value Chain Activity (FTFE VCA) is part of the US government's Feed the Future initiative and the Government of Ethiopia's (GoE) Agricultural Growth Program (AGP) II, Component Four: Agriculture Marketing and Value Chains. Under AGP-II, FTFE VCA will contribute to the GoE's objective of improving agricultural productivity and the commercialization of smallholder farmers through an inclusive value chain and market systems development strategy that integrates nutrition-sensitive interventions, climate-smart agriculture, and USAID/Ethiopia's push-pull strategy. Starting January 1, 2017, this five-year program will work across select AGP-II value chains (maize, coffee, chickpea, dairy, livestock, and poultry) and focus woredas.

The information in this Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) is based on the activity work plan for the period FY 2017-2021 and the statement of work found in Section C of the contract. In addition, FTFE VCA's Environmental Mitigation & Monitoring Plan requires the preparation of a PERSUAP prior to providing assistance for the procurement or use of pesticides.

## SUMMARY OF IEE AMENDMENT

The Initial Environmental Examination (IEE) governing FTFE VCA addresses the entire portfolio of activities under the USAID/Ethiopia Agriculture Value Chain and Private Sector (AVC & PS) project under *Development Objective 1, Increased Growth with Resiliency in Rural Ethiopia*. In 2012, USAID approved the umbrella IEE to cover the Feed the Future program under the Economic Growth and Transformation Development Objective (DO 1). This IEE is USAID's governing environmental compliance document, and it recommended that PERSUAPs be produced for any activities potentially involving pesticides.

Due to the risk concerns presented by pesticides, USAID's environmental regulations require that all programs that include assistance for the promotion, procurement (directly or through financial instruments), or use of pesticides must assess risks associated with this assistance following the Pesticide Procedures described in 22 CFR (Regulation) 216.3. At least 12 factors must be addressed according to Regulation 216.3 (b)(1)(i) (a through l). These 12 factors are normally examined in a technical analysis document called a Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP).

For pesticides the IEE made a Negative Determination with the following conditions: "The DO 1 team shall ensure that any activity involving pesticides, or new pest management products or technologies will be preceded by the preparation and BEO approval of PERSUAPs in accordance with Agency guidance, and fulfilling all analytical elements required by 22 CFR 216.3(b), USAID's Pesticide Procedures. The USAID/EA environmental staff will assist the Ethiopia MEO and Activity Managers in establishing the need. New PERSUAPs will be commissioned as necessary, by the respective implementing partners."

In this document, FTFE VCA presents list of pesticides registered to control diseases, insect pests and weeds in maize, chickpea, and coffee. In addition, the list includes registered pesticides for disease and insect management of livestock in Ethiopia. This document also focuses on preventive IPM tools and techniques useful for each pest.

### **Summary of Conditions.**

Implementation of the following recommendations of good agriculture practices and integrated pest management from the PERSUAP are conditions for any assistance to FTFE VCA in Ethiopia.

**Condition 1:** A list of products that were considered but rejected in this PERSUAP is presented in Attachment 1. These products may not be demonstrated or promoted by FTFE VCA (Based on April 2017 MoNAR list of Pesticides Registered in Ethiopia, October 2013 Former DACA, now VDAFACA list of Household Pesticides, and USEPA Registration Status).

**Condition 2:** Only pesticide products Accepted/Approved by this PERSUAP, as presented in Attachments 2 and 3, will be considered for assistance for target commodities of FTFE VCA.

**Condition 3:** FTFE VCA will work and build on the work of the Commercial Farmers Service Project (CFSP). Each Commercial Farm Service Center (CFSC) and agro-input dealers supported by the activity will acquire, have at their sales offices, and use Material Safety Data Sheets (MSDS) for each approved pesticide.

**Condition 4:** FTFE VCA will perform repeated integrated pest management, safer pesticide use, and recordkeeping training for all implementers and beneficiaries that promote, procure, or use pesticides with project assistance.

**Condition 5:** FTFE VCA will conduct a pesticide safer use and recordkeeping training for program supported agronomists, veterinarians, and any activity staff that will be engaged in pesticide handling.

**Condition 6:** FTFE VCA shall ensure farmers and clients that purchase pesticides from activity supported input suppliers (CFSCs and agrodealers) will receive in-house consultations and product specific information on how to use the pesticide, safety equipment, dosage, storage, and disposal of empty container, and other important safety considerations.

**Condition 7:** FTFE VCA will annually check the MoANR and US EPA registration status of pesticides approved in this PERSUAP for changes of special concern to assure that the pesticides offered by activity supported input suppliers and agrodealers are concurrent with the MoANR and US EPA list.

**Condition 8:** FTFE VCA staff will regularly monitor the efficacy of pesticides used by farmers to note any reduction in efficacy and likely occurrence of pest resistance.

**Condition 9:** If FTFE VCA wishes to provide assistance for the procurement or use of pesticides not included in the approved pesticide list, FTFE VCA shall submit an amendment to the IEE/PERSUAP requesting BEO approval of the additional pesticide(s).

**Condition 10:** FTFE VCA will uphold the directive that any person who imports pesticides or sells pesticides shall be responsible for the disposal of any obsolete pesticide in his/her custody at own expenses. No person shall dispose of any pesticide or pesticide waste contravening the rules and regulations of the GoE and in a manner that may harm people, animals or the environment.

**Condition 11:** For all demonstrations, FTFE VCA implementers shall introduce pest and pesticide record-keeping concepts and tools following the appropriate best management practices.



# I. INTRODUCTION

## I.1 SCOPE & AIM OF THIS REPORT

USAID Environmental Procedures (Title 22, Code of Federal Regulations (CFR) Part 216 (22 CFR 216), or simply Reg. 216), stipulate that projects involving assistance for the procurement or use, or both, of pesticides shall be subject to the procedures prescribed in §216.3(b)(1)(i) through (v). Consequently, pesticide use in USAID-funded projects, requires the approval by the USAID/Bureau Environmental Officer of a Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP). This report meets this requirement.

## I.2 PROJECT DESCRIPTION & TARGET GEOGRAPHIC AREAS

USAID's FTFE VCA is part of the US government's Feed the Future initiative and the Government of Ethiopia's (GoE) Agricultural Growth Program (AGP) II, Component Four: Agriculture Marketing and Value Chains. Under AGP-II, the FTFE VCA will contribute to the GoE's objective of improving agricultural productivity and the commercialization of smallholder farmers through an inclusive value chain and market systems development strategy that integrates nutrition-sensitive interventions, climate-smart agriculture, and USAID/Ethiopia's push-pull strategy. Starting January 1, 2017, this five-year program is working across select AGP-II value chains (maize, coffee, chickpea, dairy, livestock, and poultry) and focus woredas.

# 2. PESTICIDE EVALUATION REPORT (PER)

This Pesticide Evaluation Report (PER) addresses the 12 factors in Regulation 216.3(b)(1) Pesticide Procedures. Through this PERSUAP, FTFE VCA requests USAID approval to provide assistance for the use or procurement of the pesticides in Attachment 2/3, and it provides the necessary supporting documentation as required by USAID's Pesticide Procedures. If a pesticide not yet approved in this PERSUAP is needed, FTFE VCA will notify USAID of the need to amend this PERSUAP to request approval of the additional pesticide(s).

For the purposes of this PERSUAP, the term pest is used in a broad context, to include all organisms (insects, bacteria, fungi, weeds, rats, etc.) that can lower harvest yields or quality of crops once they reach a certain population density and distribution. Pests are also those organisms that damage the hide and skin or cause discomfort to the animals themselves. Pesticides, therefore, is a broad category that includes any of a number of chemicals such as insecticides, rodenticides, nematocides, herbicides, fungicides, livestock dips, and various other substances intended to prevent, destroy, repel, or mitigate any pest.

"Assistance for the use" is interpreted broadly to include handling, transport, storage, mixing, loading, application, cleanup of spray equipment, and disposal of pesticides, as well as providing fuel for transport of pesticides and providing technical assistance and training in pesticide use and management. "Assistance for the use of pesticides" is said to occur if recommendations are provided for specific pesticides, including a recommendation to procure certain pesticides. This includes training courses in pesticide use, including information on safe pesticide use even if training does not involve actual application of pesticides. This broad interpretation of "assistance for the use of pesticides" applies throughout this PERSUAP.

## 2.1 PESTICIDE APPROVAL CRITERIA

Only pesticide products Accepted/Approved by this PERSUAP, as presented in Attachments 2, 3, and 7, will be considered for assistance for target commodities of the FTFE VCA. The products identified by

Trade Name are very specific and PERSUAP approval is only granted for the exact Trade Names identified in this table. Other products with similar Trade Names may not be registered in Ethiopia per the 2017 list of registered pesticides.

Attachments 2 and 3 identify the following factors:

- The pesticide active ingredient (AI)
- Significant issues requiring mitigation, if applicable
- USEPA registration status and toxicity classification of each AI
- WHO toxicity class

Pesticides generally contain just one AI, but can contain more than one, in a mixture, for different types of pests or purposes. FTFE VCA is requesting approval only of AIs that are registered by the USEPA for the same or *similar* uses. Emphasis is placed on similar use because often the crops and pests found overseas are not present in the US, and therefore pesticides may not be registered for the same use, but often are registered for similar crops, pest situations, and methods of application.

In the US only, some specific commercial pesticide products are labeled as Restricted Use Products (RUPs) due to a history of inordinate risks, usually under specific circumstances of use. In accordance with USAID's Pesticide Procedures, USAID activities may not procure or use RUPs without further environmental review. For each AI, which may be present in a number of RUPs (trade names/products), there are generally additional or other products, formulations, and uses with the same AI that do not have the same risks and are thus labeled or determined to be for general use (GUP). Therefore, for each AI, RUP and non-RUP products may be available. FTFE VCA requests approval for the use of only GUPs or similar formulations to GUPs.

The WHO acute toxicity classification system, used by much of the rest of the world outside the US, is based on the AI only. FTFE VCA is requesting approval for AIs that are above WHO toxicity class I as toxicity classes Ia and Ib are considered too highly toxic for use in FTFE VCA activities. For more information on USEPA and WHO acute toxicity classification systems, see Attachment 6. All pesticides for which FTFE VCA is requesting approval are registered by the Ethiopian Ministry of Agriculture (MoNAR) and the Veterinary Drugs and Animal Feed Administration and Control Authority (VDAFACA).

## 2.2 PESTICIDE SELECTION CRITERIA

The pesticides selected for approval by FTFE VCA, as specified in Attachments 2, 3, 4, and 7, were chosen based on the following criteria:

- **Registered for use** in Ethiopia and registered for use by the USEPA.
- **Effectiveness** of the pesticide for the proposed application was a prime consideration. Every effort was made to select the least toxic chemicals that simultaneously provide maximum effectiveness.
- **Low toxicity:** When pesticides are needed to control a pest population outbreak, FTFE VCA first recommends the least toxic option and then a stronger chemical, only if needed to effectively control the infestation.
- **Available at reasonable cost** through formal distribution channels.
- **To provide an adequate range of chemicals** to minimize resistance.

## 2.3 USING PESTICIDES WITHIN AN IPM STRATEGY

USAID policy promotes the development and use of integrated approaches to pest management (IPM) whenever possible. USAID defines IPM as a strategy that aims at maintaining pest populations below

economically damaging levels and reducing the use of toxic chemicals while achieving long-term pest control and mitigating hazards to humans and the environment.

### ***Ethiopian IPM activities***

Pests in Ethiopia can cause more than 30 percent crop loss under the existing pest control strategies. In addition to existing pests, farmers are continually challenged by new pest occurrences that previously were not important or by pests where traditional control measures are failing. Often farmers also have resource limitations and cannot afford to buy relatively expensive chemical inputs required in their crop production activities, which further emphasizes the need for the development of effective IPM programs.

In Ethiopia, IPM options have not been well studied and documented. There is no policy directive to guide IPM, and IPM research efforts on field crops are very limited. Farmers have traditionally been using various cultural practices to discourage or minimize impacts of pesticides. However, no proper evaluations were made to register these cultural practices as appropriate IPM options for specific types of pests. The modern and scientific approach to IPM is a relatively recent development. Some of the highly recommended land husbandry practices, such as the application of compost, crop residue, and manure and conservation bunds are found to be breeding sites for pests and diseases such as insects, rodents, nematodes, bacteria and fungi.

The major problem with the implementation of IPM in Ethiopia is that there has been little development of the core pest management methods (cultural, biological, host plant resistance etc.) and their effective integration. The following tactics are integral features of a good farming practice for pest management:

- Careful crop breeding and selection of resistant or tolerant plants.
- Use of planting materials (seed or transplants) that are pest free.
- Proper preparation of a planting site to eliminate pest breeding sites.
- Employ good agricultural practices that provide dense, healthy, competitive crops and discourage weeds and other pests.

***Outlined below are the IPM strategies recommended for use in Ethiopia;*** which are translated to interventions into the Safer Use Action Plan (SUAP):

**Cultural Control:** Cultural practices studied and found useful in controlling several cereal and horticultural pests include appropriate disposal of crop residues, proper time of planting, tillage and mulching, spacing, intercropping, removal and destruction of volunteer and alternative host plants, removal/rouging of infested plants, proper fertilizer applications and crop rotation. Examples of practices employed in Ethiopia include:

- Crop rotation to avoid damage by root knot nematode and soil pathogens in horticultural crops.
- Control of nematodes by intercropping vegetable crops with African marigold, a nematode antagonist. Intercropping is also common, especially with maize and beans, where natural biological control agent's lower pest numbers.
- The use of trap plants (plants preferred most by a particular pest) around major field crops to create kill zones.
- Proper site selection and soil preparation is also an important IPM practice, reducing the number of pests in the cropping area before planting. For example, areas susceptible to flooding may lead to root rot and cutworm problems in certain crops.
- Producing vigorous and healthy seedlings through good nursery management such as proper seed bed preparation, fertilization, watering etc. are essential for good establishment of the crop in the field after transplanting.



**Physical/Mechanical Control:** Mechanical or physical control methods involve using barriers, traps, or the physical removal of pests to prevent or reduce pest problems. The use of physical barriers such as plastic, mulch, row covers or trenches prevent insects from reaching the crop. Other methods include hand weeding, hand picking of pests, sticky boards or tapes for control of flying insects and various trapping techniques. Some of the mechanical control measures practiced by Ethiopian farmers are:

- Heating grains on metal pans and sun drying has been two of the oldest groups of physical methods of storage pest control in pulses.
- Cereals are often sieved to separate weed seeds and damaged grains from the healthy cereal grains.
- Hand picking Fall Armyworm larva is a topical example of physical control used in maize.
- Traps are used for beetle control in cereals.
- Soil tillage during the dry season is done to expose weed seeds and insect pests to desiccation.
- Removal of damaged and diseased plants is also practiced.

**Host-Plant Resistance:** Several host-plant resistance screening studies against the important insect pests and diseases of chickpea, maize, and coffee have been successful in controlling pests, especially when they are integrated with other control methods.

- Coffee berry disease (CBD) is controlled in modern coffee plantation through the use of CBD-resistant varieties.
- Local farmers select harvested seeds from their best plants, to improve the genetic stock of their crops.
- Growers advised to use certified seeds and healthy planting materials to give better yield and market quality.
- Using certified seed will avoid the problem of seed-borne diseases and ensure optimal plant growth to better resist and compensate for any future problems.

**Biological Control:** Although a range of naturally occurring bio-control agents (parasitoids, predators and pathogens) have been reported for different pests, no successful bio-control program has been developed so far for outdoor crops at any significant scale in Ethiopia. There are several natural biological control organisms (predators) including: ground beetles, ladybeetles, wasps, mites, spiders, lacewings, etc., that are common in the Ethiopian agro-ecosystems and can naturally reduce pest levels. Furthermore, there has not been an approved policy or guideline for importing natural enemies to Ethiopian crops.

**Botanical Control:** It is a common experience for many farmers in Ethiopia to apply botanicals to control storage and field insect pests. These botanicals may act as repellent or may kill the pest directly. Neem has been used effectively as a chemical insecticide for the control of storage pests on cereals. Researchers have identified many indigenous plant species as having the potency to deter and/or kill various pests in Ethiopia but the practical applications of such findings did not move beyond the trials stage.

**Chemical Control:** Pesticide use by the vast majority of Ethiopian farmers has been very low with the volume of pesticides used by small-scale farmers ranging from zero to a few kilograms or liters per annum. This is mainly due to resource limitations with no access to credit facility and also a lack of knowledge about the advantages of using such inputs to increase farm productivity. Inappropriate use or application of pesticides (under- or over-dosage, wrong timing, wrong target) may ruin advances made with other IPM strategies. The tendency to promote indiscriminate spraying of a broad-spectrum pesticide in response to recent crisis situations such as Fall Armyworm is not consistent with an IPM approach.

## 2.4 PESTICIDE APPLICATION METHODS & SAFETY EQUIPMENT

This section examines how pesticides are to be applied, the risks with different application equipment and methodologies, and the measures to be taken to ensure safer use for each application type and pesticide.

The reasons many Ethiopian farm workers do not use Personal Protective Equipment (PPE) to reduce pesticide exposure risks include:

- Appropriate PPE are generally not available at all and if available are too expensive,
- Farmers do not understand either the warning labels or pictograms provided on the pesticide labels, since there is a high level of illiteracy especially among older rural generations and most labels are written in languages that are not commonly used in the area.
- Farmers either discredit or do not completely understand the potential health risks associated with pesticides since damages are not manifested immediately.
- Climatic conditions, particularly high temperature, make it uncomfortable to use the equipment (despite the fact that it is recommended that many pesticides should be applied very early in the morning when it is cool and not windy).

The recommended set of PPE includes: long-sleeved shirt, long pants, boots (waterproof, chemical-resistant), gloves (waterproof or chemical-resistant), goggles or any other form of eye protection, plastic apron, face mask with air filter, and overalls.

Often, farmers only have a single sprayer that they use for all spraying activities. Thus it is essential to train farmers in basic spray equipment operation and maintenance. This includes training on the mixing, cleaning, repair, and storage of the sprayer to avoid cross-contamination and potential problems. The activity encourages farmers to keep spare parts on hand (e.g. adjustable nozzles, filters, hoses, etc.) or CFSC stock them at the shops so that farmers can easily purchase to ensure optimum functioning of the equipment at all times and to avoid leaks or spills from faulty equipment.

Calibration of the spraying equipment is also a demanding and technically-challenging area. Applicators need to be taught how to calculate the volume of water needed for the spray event and how to make adjustments depending on the crop development stage so that complete coverage of the plant is achieved. Applicators also need to check for proper nozzle functioning and how to follow all label recommendations – dosage information, maximum number of sprays per crop, re-entry periods, pre-harvest intervals, and safety information.

There is growing recognition that expecting a typical smallholder farmer to understand and apply all of these complex spray-application procedures is unrealistic. The alternative systems approach to agrochemical management falls into several categories:

- Centralized spray programs led by government using contracted specialists or extension staff.
- Private-sector spray-service providers that deliver a professional service on-demand at a fee.
- Coordinated spray programs through local cooperatives.
- Ad-hoc pesticide advisory services from FSCs and smaller agrodealers.

FTFE VCA does not foresee any magic-bullet solution to the problems of pesticide management. The GAP activities and interventions will interact across all of the alternative systems. Farm-level training programs will specifically target operator safety and skills. Interaction with the agrochemical industry and extension experts will help define quick-wins to improve pesticide awareness and knowledge, and test new technologies that can reduce risk at farm level.

Concerted efforts must be geared toward educating farmers to change behavior so they actually use safety equipment. Some enforcement measures must be in place to bring about such changes through

regular monitoring. CFSC staff must also assist farmers and pastoralists to ensure their safety as well that of their environment. The involvement of the CFSC staff, in addition to providing regular advises, must be to help farmers and pastoralists acquire safety equipment or PPE and enforce its use.

Pesticide labels usually provide information about which equipment should be used for each pesticide. Each CFSC must endeavor to collect Labels and Material Safety Data Sheets (MSDS) for each product (pesticides and vet drugs) they sell or stock from the respective manufacturing companies, as practical and available. This should be followed by preparation of a quick reference guide for all the products to be used at all CFSCs for each anticipated pest, with dose rates, safety measures, environmental concerns, and minimum withdrawal periods.

**Fumigation:** Grains are often fumigated if stored for extended time periods, during which they must be kept airtight. Phosphine is commonly used in Ethiopia but must be handled with extreme care. If FTFE VCA assists in the procurement or use of phosphine, the activity will submit environmental compliance documentation required by the Programmatic EA for Fumigation with Phosphine.

**Dust:** A pesticide dust is a dry formulation of a contact pesticide. Dusts are extensively used against pests of grain, oilseeds and pulses. The pesticide particles stick on the grains when mixed, providing extended protection against grain pests. Dusts are a relatively dangerous formulation type as they drift easily and can enter eyes and respiratory passages. For all dust applications, minimum PPE including long-sleeved shirt, long pants, shoes and socks, respirators, full-face mask, and gloves must be used.

**Granules:** Most granular formulations are systemic pesticides that are taken up by the plant or act on pests present in the soil. The advantage of dry granular pesticide formulations is that they can be spread manually to top-dress the soil at the base of plants or can be incorporated into the soil prior to crop emergence to target the roots of the plants as they grow, minimizing the risk of spray drift or evaporation. Granular formulations break down and release the active ingredient over time, allowing for longer intervals between applications. If granular pesticides or dusts are spread on top of the soil, they usually are watered in immediately after application thereby minimizing potential contamination of persons entering the field after application. Pests residing in the soil and those feeding on the germinating/establishing plants are usually controlled with granulated pesticides.

**Bait:** Bait formulations are prepared by poisoning the most preferred food of a particular pest. In this PERSUAP, dry bait formulations comprising of potent rodenticides are proposed for rodent control. Effective bait is prepared from an advanced formulation of poisoned food that produces a fresh tasting, highly compressed pellet, noted for outstanding palatability and a long shelf life. Pellets hold up well in adverse conditions, making them a popular choice in moist conditions. In some instances, it is possible to include some phagostimulants (materials that attract the pest) in the formulation to enhance efficacy. Micro-encapsulation of bait particles would prolong the shelf life and functional durability of baits. The hardness of the pellet also satisfies the rodent's desire to gnaw. Since vertebrate pests can easily develop "bait-shyness," it is essential to follow certain steps to avoid this. Because baits remain in the environment for some time, care must be taken to ensure non-target organisms, including humans, stay away from the bait. The minimum PPE include: long-sleeved shirt, long pants, boots, and gloves.

## 2.5 MITIGATING TOXICOLOGICAL HAZARDS

This section examines the acute and chronic toxicological data associated with the proposed pesticides. In addition to hazards, this section also discusses measures designed to mitigate any identified toxicological hazards, such as training of applicators, use of protective clothing, and proper storage.

**Table 1: Lists of the requested pesticides with moderate to high toxicity to amphibians and terrestrial bees**

No	Active Ingredient	Chemical class	Use Category	Aq Tox: amphibians	Terr ecotox: bees
1	Mancozeb (All formulations)	Dithiocarbamate, Inorganic-Zinc	Fungicide	Highly toxic	Moderately toxic
2	Thiamethoxam (all formulations)	Neonicotinoid	Fungicide & insecticide (only seed treatment use permitted)	No information	Very highly toxic
3	Thiram (All formulations)	Carbamate	Fungicide and seed treatment	Very highly toxic	Not acutely toxic
4	2,4-D (All formulations)	Chlorophenoxy acid	Herbicide	Slightly toxic	Highly toxic
5	Abamectin (All Formulations)	Microbial extract	Insecticide	No information	Highly toxic
6	Acephate	Organophosphorus	Insecticide	Slightly toxic	Highly toxic
7	Alpha cypermethrin (All formulations)	Pyrethroid	Insecticide (crop uses only)	No information	Highly toxic
8	Bifenthrin	Pyrethroid	Insecticide	No information	Highly toxic
9	Chlorpyrifos (All formulations)	Organophosphorus	Insecticide	Moderately toxic	Highly toxic
10	Clofentezine	Pyrethroid	Insecticide	No information	Highly toxic
11	Cyfluthrin	Pyrethroid	Insecticide	No information	Highly toxic
12	Cypermethrin (All formulations and admixture)	Pyrethroid	Insecticide	No information	Highly toxic
13	Deltamethrin (All formulations and admixture)	Pyrethroid	Insecticide	Very highly toxic	Moderately toxic
14	Diazinol/ Diazinon (All formulations)	Organophosphorus	Insecticide	Moderately toxic	Highly toxic
15	Dimethoate (All formulations)	Organophosphorus	Insecticide	Highly toxic	Very highly toxic
16	Fenithrothion (and Admixture)	Organophosphorus	Insecticide	Moderately toxic	Highly toxic
17	Fipronil	Pyrazole	Insecticide	No information	Highly toxic
18	Imidacloprid	Chloro-nicotinyl	Insecticide (only seed treatment use permitted)	Slightly toxic	Very highly toxic
19	Malathion (All formulations)	Organophosphorus	Insecticide	Highly toxic	Highly toxic
22	Permethrin	Pyrethroid	Insecticide	Slightly toxic	Highly toxic
20	Spinosad	Microbial	Insecticide	No information	Highly toxic
21	Lambda – cyhalothrin (All formulations)	Pyrethroid	Insecticide and Acaricide	No information	Highly toxic
22	Carbaryl	Carbamate	Insecticide and Nematicide	Moderately toxic	Highly toxic

**Minimizing Human Hazards:** The WHO estimates that about 220,000 deaths from acute pesticide poisoning occur globally per year. The greatest risk is exposure to concentrated pesticide product when the pesticide package is transported or opened and mixed with water. Different pesticide formulations pose different threats when the pesticide solution is prepared. Ideally, a water soluble bag should eliminate exposure during preparation if used correctly. The soluble and emulsifiable concentrate will require careful handling to measure and mix with both presenting a splash hazard. Liquid formulations may be absorbed if spilled or splashed onto skin. Wettable powders are messy and difficult to measure and mix. While both the dust and aerosol are ready-to-use, they may be inhaled inadvertently due to their fine particles thus requiring the use of additional PPE. While liquid formulations are relatively easy

to pour, measure and mix, they are more likely to be harmed by heat and cold than dry formulations. They are also more likely to penetrate exposed skin. Liquid formulations containing water are not packaged in water soluble packages (WSP) because they will dissolve the packaging. Since emulsifiable concentrations are not compatible with WSPs some materials are formulated into gel packs as an alternative.

Pesticides can enter the body in four major ways: through the skin, the mouth, the nose, and the eyes. A checklist is given below to help avoid these various routes of overexposure to pesticides.

***To avoid dermal (skin) exposure:***

- Check the label for special instructions or warnings regarding dermal exposure.
- Use recommended protective clothing and other equipment as listed on the label.
- Do not re-enter the area until deposit has dried or re-entry interval is past.

***To avoid oral (mouth) exposure:***

- Check the label for special instructions or warnings regarding oral exposure.
- Never eat, drink, or smoke, chew tobacco while working with any pesticide. Wash thoroughly with soap and water before eating, drinking, smoking, or chewing tobacco.
- Do not try to blow-off clogged nozzles by mouth.
- Do not wipe mouth with contaminated hands or clothing.
- Do not expose food, beverages, drinking vessels, or cigarettes to pesticides.
- Wear a face shield when handling concentrated pesticides.

***To avoid respiratory (lung) exposure:***

- Read the label to find out if respiratory protection is required.
- If respiratory protection is required, use only an approved respiratory device.
- Stay upwind during application.
- Use masks with filters making sure that the battery is functional (batteries last about 8 hours).

***To avoid eye exposure:***

- Read the label to find out if eye protection is required.
- If eye protection is required use goggles to protect eyes or a face shield to protect eyes and face.
- Keep pesticide container below eye level when pouring.

Training program addresses the human and environmental risks associated with pesticide use and provides pesticide applicators with the knowledge they need to minimize these hazards. Specifically, to address human toxicological hazards, hands-on practical training in the proper use, cleaning, storage, and care of personal protective equipment is emphasized and the proper methods for mixing, applying, storing, and disposing of pesticides are covered. First aid kits must be available nearby during packing, transporting, storing, mixing, and applying.

**Minimizing Environmental Hazards:** The CFSC workers and farmers receive training in the proper use of pesticides to avoid environmental contamination and negative effects on non-target organisms. This includes discussions on the soil types, hydrologic resources, and native flora and fauna in the area. The importance of protecting these resources and being aware of the potential impact of sloppy work practices is emphasized. The training includes the identification of any natural creeks, streams, lakes or other water sources nearby, the origination and outlet of these water resources, and their uses. In addition, the proximity of neighboring farms (crop or livestock), residential buildings, or wooded or

protected areas to the areas under chemical control are assessed and mitigation measures developed to avoid any contamination of these areas.

Besides exposure in the treated zones, farm and wild animals are exposed to pesticides when farmers clean their sprayers. Puddles filled with pesticide remains might attract animals. Rinsing spray equipment in or close to surface water or groundwater sensitive locations, including high proximity to wells and irrigation channels, presents hazards for humans, animals, fish and aquatic life. Farmers must be made aware of methods of safe disposal of empty pesticide containers, and that if not disposed of carefully, pesticides can threaten humans, farm animals, and wildlife.

### **Recommendations**

- Train CFSC experts, farmers, applicators, pesticide salesmen and extension service specialists on risks and exposure problems for applicators, farm animals, and surface and groundwater. Ethiopian farmers and other respective pesticide users require training in pesticide risk management.
- Develop or adapt posters on use of safety equipment correctly and efficiently as discussed above. For many projects using pesticides, posters exist to remind users of risk reduction measures and should be displayed and distributed in local languages wherever pesticide users are present. This can also be done as part of a training program.

## **2.6 PESTICIDE EFFECTIVENESS**

All of the pesticides requested in this PERSUAP are registered by the USEPA for the same or similar uses. All pesticides registered by USEPA go through a lengthy and rigorous laboratory and field-testing program to determine their effectiveness in controlling specific pests on specific crops. The same is true for the Ethiopian registration process, which has the added advantage of having tested these pesticides under local environmental conditions. The proposed pesticides are used in Ethiopia and other East African countries to control the main pests that affect major regional crops and livestock, including poultry. They are commercially available throughout the country and include products that are known to be effective.

All of the pesticides requested in this PERSUAP were selected based upon effectiveness and availability in Ethiopia. However, with the extensive use of specific pesticides, a major concern to be addressed is the development of resistance of target pests toward respective pesticides, based on past and present pesticide use. To avoid pesticide resistance, farmers need to employ a rotation of pesticides from different classes or a mixture of pesticides to target different sites. Some shopkeepers may alter pesticides to increase perceived product volume by adding dusts, powders, or water. Pesticide users' concerns have to be addressed and in case of inefficient control, the possibility of dilution must be considered. Many other factors can cause pesticide inefficiency including failures in spray solution preparation, old spraying equipment, incorrect spray timing, and wrong pest identification among others.

Pesticide efficacy can be tested in the laboratory following standard efficacy trial methods as well as in the field at multiple locations in different seasons either under natural or artificial infestations. Ideally all available and environmentally sound pesticides representing different chemical classes should be frequently tested in research stations and monitored in farmers' fields. This requires a large coordinated effort that Ethiopia should be able to provide in the near future based on a relatively well-established crop protection service and monitoring system. Development of a standardized, coordinated, and professional evaluation system can be supported by the CFSC. Small on-farm demonstrations plots will be established with farmers as co-partners to familiarize all target groups with the concept of field studies, symptomatology, pest and disease dynamics, data collection and simple data analysis.

There is a problem with adulteration of products – diluting, improper repackaging, or simply counterfeiting. This problem is common with the traders who operate kiosks in open-air markets, for



example. This is one of the key reasons why FTFE VCA is working through the CFSCs and agrodealer networks to make sure only effective and genuine products are sold to and used by farmers. CFSC retailers are required to sell only brand- name (non-generic), registered products in original packaging from the manufacturers. The pesticide industry is largely self-policing. The major chemical companies such as Dupont, Bayer, Syngenta, and BASF will only work with professional, formalized retailers like the CFSCs, and the distributors monitor CFSC activities to ensure their products are not being misused.

## Recommendations

- CFSC should teach farmers to monitor and rotate pesticides from different classes to reduce the build-up of resistance.
- CFSC and extension staff should monitor the use by farmers of recommended dose of the pesticide to avoid over- or under-dosing.
- Monitor pest resistance to pesticides by observation, farmer feedback, and other indications of efficacy reduction.
- Program staff should regularly monitor efficacy of pesticides under farmer's conditions to note any reduction in efficacy.

## 2.7 PESTICIDE COMPATABILITY WITH TARGET & NON-TARGET ECOSYSTEMS

This section examines the potential effect of each FTFE VCA-requested pesticide on organisms other than the target pest (for example, the effect on bee colonies in the spray area). Non-target species of concern include birds, fish, aquatic organisms, and beneficial insects.

The chemical and physical behavior of pesticides must be taken into account to maintain minimal non-target exposure. These processes can be grouped into those that affect persistence, including photo-degradation, chemical degradation, and microbial degradation; and those that affect mobility, including sorption, plant uptake, volatilization, wind erosion, runoff, and leaching. Pesticide persistence and mobility are influenced by the properties of the pesticide. Some of the most important properties of a pesticide that can be used to predict environmental fate include half-life, soil sorption coefficient, water solubility, and vapor pressure. Some pesticides are more stable than others under the same conditions. When applying any pesticide, it is important to recognize that several environmental factors (light, temperature, moisture, pH, bacteria) will impact the active ingredient to a greater or lesser extent. The rate at which pesticides break down affect their persistence and active time for pest control, off target movement, groundwater, surface water, and other possible environmental contamination.

Any pesticide will remain in the environment for some time and travel to some degree. To make sound pest management decisions, pesticide users, advisors, and resource managers should have an understanding of the fate of pesticides in the environment. Pesticide fate within the environment depends on the rate, timing, and method of application, as well as a variety of dynamic and interrelated physical, chemical, and biological processes. These processes are influenced by environmental conditions that are often site-specific. Careful consideration of these processes and their interaction is necessary to evaluate the risk to non-target ecosystems.

In many activity areas, farms are close to water systems. Because of this, the greatest environmental concerns associated with pesticide use relate to surface water and groundwater contamination by spray drift, runoff, or leaching. Due to the movement of water, negative pesticide effects can reach far beyond the point of application.

Reducing pesticide injury to honey bees requires communication and cooperation between beekeepers, farmers, and chemical applicators. It is important for beekeepers to understand cropping and pest

management practices used by farmers in their vicinity. Likewise, insecticide applicators should be sensitive to apiary locations, obtain a basic understanding of honeybee behavior, and learn which materials and application practices are most hazardous to bees. While it is unlikely all poisonings can be avoided, a balance must be struck between the effective use of insecticides and the preservation of pollinators. In most cases, bee poisonings can be avoided or at least minimized by observing the following practices:

- Do not treat fields in bloom. Be especially careful when spraying pollinating crops. The label of certain insecticides expressly prohibits application to flowering crops.
- Examine fields and field margins before spraying to determine if bees are foraging on flowering weeds such as milkweeds, smartweed, or dandelions. Where feasible, eliminate weeds through mowing or tillage.
- As much as possible, choose products with short persistence and low-hazard formulations if insecticides absolutely must be applied during the flowering period to save the crop. Notify local beekeepers as far in advance as possible.
- Avoid spray drift. Give careful attention to bee colonies positions relative to wind speed and direction. Avoid spraying when wind speed is high.
- Apply insecticides when bees are not foraging. Some insecticides can be applied in late evening or early morning with relative safety. Adjust spray programs in relation to weather conditions.
- Reconsider the timing of insecticide application if unusually low temperatures are expected that night because residues can remain toxic to bees which enter the field the following day. Cease applications when temperatures rise and bees re-enter the field in early morning.
- Avoid treating during hot evenings if beehives are very close to the target field and honey bees are clustered on the outside of the hives.
- Read the pesticide label. Carefully follow listed precautions with regard to bee safety.

### **Recommendations**

FTFE VCA shall conduct the following activities through training and technical assistance:

- Recommend implementation of biological and cultural controls with pesticides as a last resort.
- Use non RUP pesticides which are less hazardous as much as possible.
- Apply pesticides at least 35 meters away from open water to avoid harming fish and other aquatic organisms.
- Monitor any adverse effect on target and non-target environments and respond appropriately by utilizing mitigation measures including discontinuation of the respective pesticide.

## **2.8 CONTROLLING PESTICIDE RUNOFF**

Monitoring weather conditions and the amount and timing of irrigation can help minimize pesticide leaching. Careful pesticide selection is important because those that are highly water soluble, not readily absorbed, and not rapidly degraded are the most likely to leach. Labels must be carefully inspected for application instructions such as rates, timing, and method. Labels may also contain statements that advise against the use of the pesticide when certain soil, geologic, or climatic conditions are present.

Pesticide runoff is usually greatest when a heavy or sustained rain follows soon after an application. Runoff can also occur if a pesticide is applied to saturated soil, resulting from previous rains or irrigation followed by a light rain or irrigation. Practices used to reduce pesticide runoff include monitoring weather conditions, careful application of irrigation water, using a spray mix additive to enhance pesticide retention on foliage, and incorporating the pesticide into the soil. Reduced-tillage cropping



systems and surface grading, in addition to contour planting and strip cropping, can also reduce pesticide runoff. Finally, dikes or a border of untreated vegetation can slow the movement of runoff water and help keep it out of wells, sinkholes, water bodies, and other sensitive areas. Widely used furrow irrigation represents a potential risk for transport of pesticides applied prior to the irrigation. Therefore, it has to be ensured that no run-off water leaves the field or orchard by closing irrigation furrows 35 meters before the end of the field at a minimum. Special attention has to be given to pesticides with high groundwater contamination potential, those posing risks to fish and other aquatic life, as well as to slowly degrading substances.

Recommendations should include information about spray drift and wind; avoiding water contamination; and understanding geographic landscape before applying pesticides.

## 2.9 AVAILABILITY OF OTHER PESTICIDES OR NON-CHEMICAL CONTROL METHODS

This section identifies other options for pest control and their relative advantages and disadvantages. There are various non-chemical pest control methods including some techniques of IPM, biological control and cultural practices. By having a variety of chemical and non-chemical approaches available, program farmers are able to rotate control strategies to address pest infestations. This helps prevent pest resistance development; reduce negative effects on non-target organisms or contamination of the environment from pesticide residues; and improve the efficacy of the IPM approach by having additional, more effective pesticides available for use, when necessary.

Cultural controls (e.g. crop rotation, sanitation, selective planting dates to avoid pests) and mechanical controls (e.g. uprooting, weed harvesting, cultivation, and use of insect traps) also play a vital role. Biological controls are available commercially from several international companies. Predators and parasitoids against spider mites, beetles, leaf miners, mealybugs, thrips, aphids, whiteflies, and moth and butterfly larvae are available. All internationally established standards regarding introduction of non-indigenous species should be followed when introducing biocontrol agents from outside the region. Therefore, it is highly advisable to only use organisms which are already readily produced in Ethiopia.

There exist pesticide active ingredients that are derived from natural or biological sources, and are evaluated by this PERSUAP and identified as being potentially useful. Some of these chemicals are: compounds derived from plants like neem oil (*Azadirachtin*), pyrethrum with pyrethrins from chrysanthemum flowers, microbial-derived products like spinosad, and abamectin (*Avermectin*).

## 2.10 PESTICIDE REGULATORY ENVIRONMENT IN ETHIOPIA

The various government institutions involved in the policy and legal frameworks that influence the pesticide industry include the following:

- **MoANR:** Animal and Plant Health Regulatory Directorate; pesticide import permits and inspection; control of migratory pests.
- **National Pesticides Registration Committee:** Pesticide applications; efficacy trials data; technical review; registration.
- **Ministry of Trade:** Pesticide trade licensing of importers/agents.

Proclamation No.674/2010 states that only the MoANR is mandated to register pesticides in Ethiopia. No person may formulate, manufacture, import, pack, re-pack, label, sell, distribute, store, or use a pesticide not registered by the Ministry or contrary to the conditions of its registration. The registration process begins with the pesticide undergoing a series of efficacy trials for the intended crop/pest combination. The normal registration process takes 3-5 years for a completely new active ingredient. If a submitted pesticide contains an active ingredient already found in registered products, or if a registered

product is being submitted for alternative crop/pest combinations, the registration is much quicker due to a shortened trialing process. To establish proper pesticide, import and distribution in the country, the regulatory department evaluates the competency and certification of companies involved in the business of importing and distributing pesticides. Efforts have been made to train a good number of inspectors from the regional bureaus of agriculture to monitor pesticide distribution and sales in the regions.

**Packaging:** The Pesticide Registration and Control Decree No. 20/1990 stipulates that pesticides should be packed in packages that comply with international standards and must be labeled according to local pesticide registration rules. Pesticides should only be stored in original containers and not in containers manufactured for other purposes. The Decree also states that, regardless of the quality standards of the pesticide package and pesticide packaging area, the undue hazard of a pesticide to humans, animals and the environment at large should be confirmed by pesticide inspector of the Ministry of Agriculture.

**Labeling:** Proper labels are required on containers (on both unit packs and boxes) to advise users on safe handling procedures. According to the provisions of the Special Decree, the label should be written on the pesticide package in both English and Amharic. Moreover, leaflets detailing additional safety procedures must be included in each box of packed pesticide. The local pesticide registration regulation requires that pesticide labels must comply with the following set rules that should appear on the label:

- Brand name and common name of the active ingredient
- Hazard diagram (according to WHO)
- Batch identification number, name, and address of registrant
- Directions for use
- Safety precautions and first aid advice
- Manufacturing date and shelf-life
- Pack unit and method of disposal
- Pictograms

**Pesticide Distribution/Retail Sales:** A special license is required to operate pesticide retail stores. Although the MoT issues this license, the MoANR's concurrence is required in the form of a supporting letter based on an assessment of pesticide management and safety procedures that the individuals requesting the permit will use. A university degree or a diploma in agriculture is usually sufficient to obtain the license. Once the permit is issued to an individual, however, there is no monitoring mechanism to ensure the permitted individual will personally supervise the sale of pesticides, rather than an untrained employee.

**Obsolete Pesticides:** According to the MoANR there are still 1,500 tons of obsolete pesticides (both agrochemicals and public health products) and about 2,000 tons of contaminated soils, treated seeds, empty containers and spraying equipment in Ethiopia. Collection, packaging, and shipping to Europe for safe disposal is in progress through funding by USAID and other donor agencies. The Ministry has so far disposed of about 2,600 tons of obsolete pesticides in two phases through the African Stockpile Program initiatives. There is a dire need to create awareness among decision makers, crop protection staff of the federal and regional bureaus of agriculture, pesticide importers, wholesalers, retailers, and end users not to keep unnecessary stocks of pesticides.

**Pesticide Storage:** There is a safety need for improved pesticide storage facilities in the country. Pesticides are stored by commercial growers in secure chemical stores but the standards are extremely variable and often pesticides are stored with other agricultural goods, which is not recommended. For smallholders, pesticides are often kept in small containers in the farmers' houses – either suspended from the roof or stored on walls – along with spraying equipment. In some cases, farmers bury pesticides underground for security. Most informal pesticide dealers and distributors store pesticides together with edible commodities. There is no regular monitoring of pesticide retail facilities.

**Pesticide Transport:** There is no regulation governing the transport of pesticides in Ethiopia. Road transport is the main form of getting pesticides to regional states and zones from the central chemical stores and wholesalers in Addis Ababa. On paper, supervision is provided by the Animal and Plant Health Regulatory Directorate (APHRD) of the MoNAR and regional agricultural bureaus. In practice the logistics systems are poorly monitored and regulated.

**Pesticide Use/Application:** No special licenses are required to apply pesticides in Ethiopia, and there is nothing equivalent to the USEPA's classification of pesticides as those intended for general use or those designated as Restricted Use Pesticides (RUPs). In the US, pesticides belonging to Class I and II are supposed to be applied by licensed operators only. The pesticide registration system in Ethiopia does not have mechanisms to implement restricted use of pesticides, even though a good number of the pesticides belonging to RUPs are registered for use in large scale farms, where application is carried out by trained pesticide applicators.

A special license is required to operate pesticide retail stores. Although the MoT issues this license, the MoANR's concurrence is required in the form of a supporting letter based on an assessment of pesticide management and safety procedures that the individuals requesting the permit will use. A university degree or a diploma in agriculture is usually sufficient to obtain the license. Once the permit is issued to a given individual, however, there is no monitoring mechanism to ensure that the individual will personally supervise the sale of pesticides, rather than an untrained employee. In practice, the person behind the counter is not trained in pesticide management. In many places in Ethiopia, it is not uncommon to see salespersons (or even crop protection staff) living in the same room or in a room adjacent to the pesticide store. Unlicensed general stores and itinerant vendors also carry pesticides.

Most of the pesticides used in Ethiopia are imported from Germany, Switzerland, England, Japan, Israel, Belgium, India, and the US. The Adami Tulu pesticide formulating plant also supplies the local market. Registered pesticides for agricultural use are purchased through 40 licensed pesticide distributors. There are both governmental and private retailers of pesticides. Farmers normally purchase pesticides in small quantities and they rarely read the instructions.

**Pesticide Disposal:** Currently, there is no incineration facility in Ethiopia for safe disposal of empty containers, obsolete pesticides, and torn containers. Thus it is customary for empty and torn containers to be burnt or buried in pits.

**Summary:** FTFE VCA does **not** intend on dedicating significant resources to resolving various pesticide issues associated with the public-sector enabling and regulatory environment. Firstly, this is in response to the recognition of other development partner projects that are already addressing this area and the consequential need to avoid duplication. Secondly, it will allow resources for pesticide management to be more targeted at private-sector initiatives directly impacting farmers and distributors over the next four years. Lastly, FTFE VCA already has a priority set of policy/regulatory interventions aligned with the new USG Food Security Strategy for Ethiopia in areas such as seed, marketing, youth, and nutrition.

## 2.11 TRAINING USERS & APPLICATORS

USAID recognizes that safety training is an essential component in programs involving the use of pesticides. The need for thorough training is particularly essential in countries like Ethiopia, where the level of education of applicators may typically be low. As a result, training provided by project staff, extension agents, and agrochemical distributors is a core component of the SUAP. The field-based training is a combination of discussions and demonstrations. Pesticide applicators receive training on the safety and proper handling of pesticides as well as the human and environmental risks and consequences when performed otherwise. Training materials will be translated into the local language and backed up with suitable manuals. Training sessions should be organized and given to all individuals who may come in contact with pesticides as part of their work.

**Training of trainers** shall include FSC agronomists, veterinarians, woreda agricultural extension agents, and crop protection specialists. The training should use a hands-on approach; in addition to lectures and classroom exercises, the participants should have ample time to visit and observe activities related to pesticide handling in selected representative sites. The trainees who have participated in the training are expected to train farmers and extension staff. Contents of the course shall focus on the following areas:

- Good agricultural practices and good husbandry practices
- Difference between GUP and RUP
- Active ingredients and pesticide formulations
- Pesticide label information
- Pesticide application techniques
- Calculation of application rates and calibration of equipment
- Pesticide fate and impact on the environment and non-target organisms
- Safety in pesticide handling, storage, and transport
- Personal protective equipment needs, use and maintenance
- Pesticides as part of integrated pest management
- Disposal of obsolete pesticide and used pesticide containers.
- Integrated pest management

**Training of pesticide dealers** shall include pesticide traders and wholesalers. The course will be tailored to the key aspects of safe handling of pesticides with emphasis on the following areas:

- Definition, types, and classification of pesticides
- Pesticide registration and regulation
- Safety in pesticide handling, storage and transport
- Standard storage facility
- Active ingredients and pesticide formulations
- Pesticide label information
- Pesticide application techniques and use of PPE
- Keeping record of pesticide inventory

## 2.12 MONITORING USE & EFFECTIVENESS OF EACH PESTICIDE

An ongoing monitoring program has been incorporated as an integral component of this PERSUAP to ensure that CFSC agronomists and veterinarians have hands-on experience with crop and livestock protection issues in the field. They will be trained to scout for pests on a regular basis by conducting field and animal health surveys on a systematic basis. When chemical control is deemed necessary, CFSC agronomists and veterinarians work closely with local extension agents and farmers to select the least toxic pesticide to address the problem and provide recommendations on proper application procedures. Accurate records of any pest control measures will be taken and the results analyzed to determine the effectiveness of the treatment strategies and the pesticide interventions used against the target pest populations. Records of farmers, as well as CFSC staff agronomists, will need to note any reductions in pesticide efficacy experienced, which is the first indication that resistance may be developing, and then a strategy needs to be in place to determine a shift to a different pesticide class, rotation among classes, and implementation of other resistance management options to overcome resistance development.

**Recordkeeping:** On most farms and in pesticide stores, pesticide use documentation is often incomplete or not retained from year to year. Developing a more systematized approach to record keeping will allow seasonal and annual comparison of pesticide effectiveness, pest numbers, crop production, maintenance of safety equipment, and so on. The following aspects could be included in the record keeping system:

- **A pesticide checklist:** This list allows agronomists to ensure that the pesticides they are using are allowed by international treaties (POPs, PIC), local national Ethiopian regulations, the USEPA.
- **IPM measures tried/used:** Agronomists and veterinarians should try to incorporate new IPM measures each year and document its success or failure. Agronomists and veterinarians should use contacts in the industry, agricultural research organizations or from University to stay in touch with current IPM techniques.
- **Monitoring/recording pests:** Agronomists and veterinarians should incorporate into their records regular field pest monitoring and identification.
- **Environmental conditions:** Field conditions should be incorporated into the record keeping system (for example; precipitation, soil analyses and moisture, soil pH, temperatures and so on). The information should be transmitted at least annually to be incorporated into reports.
- **Pesticide related incidence:** Human poisonings and incidences of chronic health issues, farm animal and livestock deaths, any incidences of water pollution, fish, bird, wildlife or honeybee death should also be recorded and reported in pesticide environmental and human health safety annually.
- **Training/capacity building in IPM and safe use:** Hands-on, demos, sessions, meetings, extension, flyers, brochures, pamphlets, posters, crop technical GAP information sheets, and radio and TV outreach/safety message enforcement

### 3. SAFER USE ACTION PLAN (SUAP)

The analyses in the Pesticide Evaluation Report (PER) cover 11 factors of pesticide evaluation identifies several concerns on handling, storage, transport, application, and disposal of pesticides. Mitigation measures are needed to increase the safety of pesticide use to both the environment and human health.

#### 3.1 SUAP CONDITIONS FOR IMPLEMENTATION

- Only registered pesticides whose active ingredients are approved by USEPA, the MoANR and VDAFACA can be procured, used, or recommended for use with USAID funds.

*Note: This condition does not provide an approval option of USEPA, MoANR or VDAFACA. Therefore, there may be a group of pesticides that fulfills all of the Ethiopian regulatory requirements but which are not USEPA approved. Constant monitoring will be required to make sure that this sub-set is excluded from FTFE VCA direct interventions.*

- Pesticide products procured, used or recommended for use must be labelled in a national language and include the following essential information: name and concentration of active ingredient, type of formulation, instructions for use, user safety information, safety periods for re-entry and harvest, Manufacturer and country of origin.
- Basic training in safer use will be provided broadly. Advanced training required for certain AIs and products.
- Pesticides for plant protection will be integrated within an IPM scheme.
- Appropriate Personal Protective Equipment (PPE) must be available.
- Observance of label instructions and safe pesticide purchase, handling, storage, and disposal.

- Recordkeeping and resistance monitoring and regular implementation reporting.

### **3.2 PRIORITY ACTIVITIES OF FTFE VCA**

Given the guiding principles to adopt safer use of pesticides, the following are the Safer Use Action Plan steps that FTFE VCA will implement to ensure the approved pesticides will be used in the safest manner and that necessary measures are taken to minimize impacts on the environment and human health. The list of team members responsible for the overall SUAP implementation is as follows:

- Mr. Habtamu Tsegaye: Crop Value Chain Advisor – Maize and Chickpea (SUAP Team Lead)
- Mr. Amenti Chali: Crop Production Specialist – Maize and Chickpea
- Mr. Tesfaye Lemma: Meat and Live Animal Specialist
- Mr. Solomon Tessema: Senior Agribusiness Coordinator – Coffee

The overall implementation timeframe for the SUAP is aligned with the work plans for the period of October 2017-September 2021. However, the priority interventions are due for rapid implementation during the first work plan period of October 2017-September 2018 with annual review process to fine-tune in subsequent years.

#### **Policy and Enabling Environment**

- Support registration of least-toxic biologicals for import/distribution.

#### **Safer Pesticide Application**

- Make arrangements with pesticide supply companies to present information about safer use and handling of their products.
- Training on calibration, use of clean water, pH regulation, and compatible mixtures and mixing order. Focus on proper dosing and measurement of pesticides going into the spray mix.
- Training for certification programs to be offered by multiple stakeholders. Help prepare for and then organize pre-certification audits.

#### **Safe Pesticide Storage, Transport and Use of PPE**

- Train clients on proper pesticide storage practices including secure storage structures and use of inventories to ensure structure and facility are up to set standards.
- Train clients to ensure crop protection products are always covered to protect them from rain and direct sunlight; monitor safe transportation of pesticides as indicated on labels to avoid human and environmental risks.
- Train clients on best practices including appropriate use of PPE, establishing safe mixing sites, disposing expired or obsolete pesticides, and first aid.

#### **Workers Safety and Personal Hygiene**

- Conduct environmental responsibility and worker safety training for suppliers and dealers; hang safety procedure posters and first-aids charts on office and store entry ports. Ensure technical staff and trainers have first-aid kits in office nearby.
- Translate pesticide guidelines into relevant local languages.
- Train applicators, pesticide salesmen, extension service specialists, farmers, and other pesticide users on pesticide risk management; train project staff and local extension agents on re-entry period for each product.

- Create awareness of danger of handling pesticides; advocate constant washing and proper hygiene.

### **Pest Identification**

- Distribute copies of the list of registered pesticides to project staff for training and monitoring.
- Conduct series of field trainings and on-farm extension visits concentrating on the major pests and diseases for the target value chains.

### **Good Agricultural Practices and Good Husbandry Practices**

- Train/refresh CFSCs, agrodealers, experts, and extension agents on soil fertility management, optimal crop production, crop protection and IPM, and postharvest handling.
- Maintain accurate and consistent GAP/GHP records.
- Work with seed companies, research centers and other partners to demonstrate high-quality seed/planting material to the activity clients.

### **Integrated Pest Management**

- Organize training on major IPM components such as resistant varieties, manipulation of the farming system to minimize pest infestation or damage (to keep below economic threshold), enhanced natural control processes, and selective use of pesticides (least toxic or organic).
- Train project clients to understand disease and pest outbreak, including basic biology, and be ready to safely control such outbreaks. Use this knowledge to implement an IPM program.
- Promote implementation of biological and cultural control with use of pesticides as a last resort. If the use of pesticides is a must, choose least toxic and non-RUP pesticides.

### **Mitigate Climate Change Related Impacts**

- Scrutinize climate change mediated impacts of pests and provide focused trainings to mitigate such impacts at the CFSC and local farmers' levels.

### **Veterinary Treatment**

- Train and establish protocols on activity planning, communication, recordkeeping, supply logistics, equipment maintenance, pesticide storage and application procedures.
- Provide training in proper site selection, pesticide selection, and application procedures.

### **Environmental Safety**

- Provide training or refreshers on safe use, storage, transport, and disposal of agrochemicals.
- Monitor for any adverse effect on target and non-target environments and respond appropriately by utilizing mitigation measures including discontinuation of the respective pesticide. Carry out environmental monitoring and reporting over the life of the project.
- Provide technical assistance during project development to ensure environmental protection.

### **Postharvest Handling**

- Hold trainings to improve sanitation practices in cleaning/processing facilities. Improve protocols and recordkeeping, especially if certification is desired.

### **Pesticide Resistance Management**

- Train farmers on how to rotate active ingredients to minimize risk of resistance development.



- Train farmers on identification of pest and proper pesticide application (type, rate, time and method of application) as indicated on the pesticide label.
- Train farmers on scouting for pest resistance following pesticide application, collection of proper information on pesticide performance.

**Table 2: Potential Training Courses**

Course Name/ Brief Summary	Duration (days)	Location	Type (Site/field/office)	Organizer/ Trainer	Attendee
Good Agriculture Practices (GAP) and Good Husbandry Practices (GHP)	10	CFSC, Lead farmers' field, demonstration fields	Field	EVCA/ CropLife	local government extension agents, lead farmers
Guidelines for Integrated Pest Management for selected diseases/pests of maize, chickpea and coffee	10	CFSC, Lead farmers' field, demonstration fields	Office and field	EVCA/ CropLife	FSC staff, local government extension agents, lead farmers
Training –of-trainers for FSC on transportation, handling, storage and disposal of agrochemicals	10	CFSC, Lead farmers' field, demonstration fields	FSC and field	EVCA/ CropLife	FSC staff, local government extension agents, lead farmers
Training-of-trainers for FSC staff on pesticide use and resistance management	10	Lead farmers' field, demonstration fields	Office and field	EVCA/ CropLife	FSC staff, local government extension agents, lead farmers

### 3.3 VALUE CHAIN SPECIFIC ACTIVITIES

#### Maize

Maize (*Zea mays L.*) is the most important and widely-grown staple food crop in Ethiopia under diverse environments. The crop continues to be a significant contributor to the economic and social development of Ethiopia. Millions of rural Ethiopians rely on maize crop as staple food. Ethiopian smallholder farmers are both primary producers and consumers of maize and they comprise about 80 percent of Ethiopia's population. More than 9 million smallholders' farmers produce maize on an area of more than 2 million hectares every year. Moreover, maize plays a central role in Ethiopia's food security since 75 percent of the maize produced is consumed as food. In addition, maize is the lowest cost source of calories and out of the total caloric intake of the country, maize contributes roughly 17 percent. The figure is high for rural dwellers (18%) and low (5%) for urban residents. This central role can be more pronounced if the major yield losses factors due to diseases and insect pests is properly managed.

The main diseases that affect maize crops across the country are gray leaf spot (*Cercospora zeae-maydis*), turicum leaf spot (*Exserohilum turcicum*), common leaf rust (*Puccinia sorghi*), maize streak virus, leaf blight, leaf spot (*Phaeosphaeria maydis*) and storage pests. Apart from commonly known diseases and insect pests, Fall Armyworm became the most important maize devastating pest in Ethiopia in February 2017. The recommended management methods in Ethiopia include: cultural practices such as manipulation of planting dates, use of resistant varieties, crop rotation, crop residue management, use of botanicals, improved storage management practices and equipment on- and off-farm, and chemical control with pesticides.

The Fall Armyworm (FAW) is a new serious migratory pest that particularly affects maize. Since its arrival in Ethiopia in February 2017, it has spread rapidly across all major maize growing areas of the country. The Plant Protection Directorate of MoANR has coordinated a rapid-response to the growing threat to smallholder crops through a combination of aggressive pesticide spraying and hand-picking.



Multi-disciplinary efforts involving research into the pest behavior and physiology, evaluating varietal resistance, and refining suitable extension materials, are well underway as part of an Africa-wide approach coordinated by the FAO and institutions such as CIMMYT.

**USAID has responded to the widespread impact of FAW across many agricultural projects in Africa by developing and releasing a specific FAW PERSUAP, entitled the FFF IPM Innovation Lab PERSUAP for Fall Armyworm – FAW (*Spodoptera frugiperda*), dated May 10, 2017.**

This PERSUAP is an amendment of the USAID/BFS IPM IL IEE, and can be used in conjunction with country-specific PERSUAPs by Feed the Future programs. The key pesticide recommendations from the FAW PERSUAP is given in Attachment 4; together with the references link in Attachment 9.

The Feed the Future Ethiopia Value Chain Activity jointly sponsored a Fall Armyworm Training of Trainers course for MoANR extension experts together with the Farmer-to-Farmer Program in September 2017. This provided insight in refining a new strategy to combat FAW using the following interventions:

- Promote awareness of FAW, its identification, damage and control to farmers, extension agents, plant health inspectors, and other stakeholders.
- Promote awareness of potentially beneficial agronomic practices, in consultation with extension agents and agronomists.
- Prepare and communicate a list of available recommended and regulated pesticides and bio pesticides, in consultation with agro-input suppliers.
- Provide support to emergency/temporary registration for the recommended pesticides and microbial bio pesticides.
- Coordinate efficacy tests of recommended pesticides to be conducted by authorized national laboratories.
- Regularly review recommendations and publicize changes promptly and widely, simultaneously monitoring FAW populations for resistance.
- Promote low-toxicity spray programs targeting a wider range of “softer” agrochemicals and biological products.
- Review and revise the recommendations for spray practices to reduce the risk to farmers and spray operatives, particularly when spraying crops at advanced growth stages.
- Improve the accuracy of yield-impact prediction and economic damage surveys.
- Evaluate new technologies for spray application that improve efficiency and reduce cost and risk
- Assess preferred crop varieties for resistance or tolerance to FAW.
- Stimulate trials and distribution of trans-genic maize varieties resistant to the pest.
- In addition to FAW, conduct training on proper control of grain storage pests (to reduce use of toxic chemicals such as Actellic), stalk borers, and site specific pests using selective pesticides will be provided.

### **Chickpea**

Chickpea is the third most widely grown food grain legume in Ethiopia and it is known as a multifunctional crop that fits well in rotation with cereals like maize and teff. Ethiopia is the largest chickpea producer country in Africa. Despite its potential yield of more than 3 tons per hectare, current national average productivity of chickpea is only 1.9 tons per hectare mainly due to diseases and insect pests, poor agronomic practices, and postharvest handlings. Chickpea is prone to potentially catastrophic (crop-failure) damage by root diseases such as *Fusarium* wilt, dry root rot and *Fusarium* root

rot; as well as foliar diseases such as *Ascochyta* blight, *Botrytis* grey mold. Among the insect pests, infestation by pod borer (*Helicoverpa armigera*) is the most severe, occurring throughout the country and has been reported to significantly reduce the crop yield. Cutworm is next to pod borer in affecting chickpea especially in the drier northern part of the country. Bruchids (*Callosobruchus chinensis*) is yet another insect that damages the seeds during storage. Timely preventive measures should be taken to prevent chickpea from insect pests and diseases attack and to maximize the yield.

Previously recommended control measures by research centers include:

- ***Fusarium* wilt:** *Fusarium* resistant varieties (eg, Arerti, Habru) should be planted in affected areas. Deep plowing during short rain season (March to April) and removal of host debris from the field can reduce the level of inocula. Excluding chickpea from crop rotations in infested fields for at least three years and seed treatment with *Trichoderma viride* at 4 grams per kilogram of seed has been found effective in reducing incidence of wilt.
- **Collar rot:** The only economic control consists of long term rotations with non-susceptible host, deep ploughing, and removing undecomposed debris from the field before sowing.
- **Dry root rot:** Longer crop rotation with cereals recommended. Seed treatment with fungicides can reduce initial development of the disease. Timely sowing of chickpea should be done to avoid post-flowering drought and heat stresses, which aggravate the disease.
- ***Fusarium* root rot:** Integrated approach that includes cultural practices (drainage), maintenance of good seed vigor, and genetic resistance is required.
- ***Ascochyta* blight:** *Ascochyta* blight can be controlled through the use of resistant cultivars, such as Arerti, Habru and Ejere. However, other practices such as the use of pathogen-free seeds, seed treatment with fungicides, foliar fungicide spray, stubble management, and crop rotation can augment disease resistance.
- ***Botrytis* grey mold:** Use of resistant varieties is the best control measure. Additionally, thinning out an infected crop to allow more light to penetrate the canopy; intercropping with a crop such as linseed, which is resistant to the pathogen; and foliar sprays of captan, carbendazim, chlorothalonil or mancozeb at regular intervals (2-3 times) starting at first appearance of the disease can control an epidemic and further spread of the disease.
- **Stunt virus:** Cultural practices such as varying sowing dates, plant density, and using borders plants that are not hosts to the virus are effective in reducing yield losses.
- **Pod borer:** Though pod borer can be effectively controlled through application of insecticides at the first and second stage {e.g. Cypermethrin (45g ai/ha) and Endosulfan (472 g ai/ha)}, an IPM strategy is recommended as it is eco-friendly, does not eliminate natural enemies of pod borer, and reduces pesticide residues and likelihood of developing resistance. Monitoring *H. armigera* population in the field is a prerequisite for successful plant protection.
- **Cutworm:** Most broad-spectrum insecticides are effective in controlling cutworm.
- **Adzuki Bean Beetle:** Different insecticides were screened and Actellic 2 percent dust at the rate of 50 grams per 100 kilograms was found effective in controlling this storage pest. However, recent studies showed that the insecticide is less effective and frequent applications are required. Botanicals: Several plants species were evaluated and efficacious plant was found. *Birbira Melletia feruginea* at 5 percent w/w gave complete protection of chickpea for long period. Nonetheless, the toxicity of this species to human being has not yet been investigated.

### Coffee

Coffee (*Coffea arabica* L.) is indigenous to Ethiopia. Ethiopia is both the center of origin and diversification of the crop. Studies have shown that Ethiopia possesses a range of environments for cultivation of coffee. However, yield and quality of coffee in Ethiopia is low due to biotic stresses such as

weeds, diseases and insect pests. Weeds in coffee range from the easily controlled annual grasses and broad-leaved weeds to the more persistent perennial grasses. Common weeds in coffee farms are *Amaranthus* species, *Agerathum conyzoides*, *Biden pilosa*, *Stellaria Senni*, *Killinga Species*, *Cynodon dactylon*, *Cyprus rotundus*, and others. Control measures include slashing, mulching, and use of manual weeding. Chemical methods include use of Round Up (AI: Glyphosate), Gramoxone (AI: Paraquat), Folar-525 FW and Glyphogen-T (AI: Terbutylazine).

Common diseases and insect pests of coffee are Coffee berry borer, Coffee thrips, Coffee leaf miner, Rainbow-colored coffee bug, Coffee leaf rust, Coffee Berry Disease (CBD), Tracheomycosis, Damping-Off (Collar Rot), and Green Scale.

Available options as control measures based on regional coffee research include:

- Use of resistant varieties and natural enemies.
- Training on control of CBD, CWD, and CRD by focusing more on use of resistant varieties.
- Improving access to disease-resistant varieties using upgraded nursery distribution network.
- Adapt farming system to minimize pest infestation or damage below economic thresholds.
- Promote and sensitize farmers and extension agents on the various mechanical control practices as part of an IPM strategy.
- Pesticide component of IPM will be adopted in severe cases only – since organic coffee production highly discourages pesticide use. Most Ethiopian coffee growers are working toward organic coffee production, which should continue to be encouraged.

FTFE VCA will focus on updating the above mentioned control measures and implement them through building capacity of CFSCs agronomists, extension agents and coffee growers by providing theoretical and practical trainings in IMP and GAPs. In addition, the activity will target on non-pesticide use control measures while implementing IPM for controlling coffee weeds, diseases, and insect pests.

### **Livestock**

Livestock pests are a major constraint limiting the production of indigenous stocks in Ethiopia. They cause loss of production and productivity, loss of access to the international markets, and reduction in the quality of hides and skins. Moreover, tick-borne diseases are constraints to improving the genetic potential of indigenous stocks through cross breeding with exotic breeds and their zoonotic potential.

Ectoparasites such as mites, ticks, chiggers, lice, fleas, and certain flies bite or bore into the skin of farm animals, weakening them, causing weight loss, ruining hides, and potentially transferring debilitating diseases. Biting flies such as black flies, sand flies, horn flies, mosquitoes, and others suck blood and irritate animals and can transmit exotic diseases such as sleeping sickness, rinderpest, and river blindness.

Note that some pesticides also have efficacy as veterinary pharmaceuticals; however, the use of veterinary pharmaceuticals for non-pesticide use is beyond the scope of a PERSUAP and veterinary pharmaceuticals cannot be approved (or rejected) in a PERSUAP. The use of veterinary pharmaceuticals should be conducted in accordance with all local and national regulations.

For the purposes of this PERSUAP, the understanding of livestock pesticides follows EPA guidelines, to include categories for fumigants, insecticides, miticides/acaricides, nematicides, antimicrobials, bactericides/biocides, microbicides/antibiotics, ovicides (kill eggs), and disinfectants/sanitizers.

**Risks from Ecto-Parasites:** In Ethiopia, Ecto-Parasites in ruminants cause serious economic losses to smallholder farmers, the tanning industry and country as a whole through mortality of animals, and down-grading and rejection of skin and hides.

Ticks are ranked as the most economically important livestock pest in Ethiopia. Ticks transmit a great variety of infectious agents, some of which are only slightly pathogenic but may cause human and livestock illness that are of tremendous economic importance. In addition, ticks can harm hosts directly by inducing toxicosis (i.e. sweating sickness and tick paralysis caused by salivary fluids and toxins); skin wounds susceptible to secondary bacterial infections and screwworm infestations; anemia; and death. Two of the three families of ticks parasitize livestock: *Argassidae* and *Ixodidae*. Certain tick species that parasitize livestock can survive several months and occasionally a few years without food, if other environmental conditions permit. The remedy for controlling tick-borne diseases is application of spraying and dipping using chemicals listed in Attachment 7.

Prevention and control of tick and tick-borne diseases will be part of the training packages focusing on:

- Supporting shoats producers for the control of Ekek by giving tailored training on effective spraying and dipping of shoats using suitable chemicals.
- Supporting suppliers, intermediary collection centers, live animal exporters, and abattoirs through a comprehensive program of tick control measures for cattle (beef and dairy).
- Linking CFSCs and agrodealers with livestock producers for the supply of effective dipping and spraying chemicals.
- Giving tailored training for CFSCs and agrodealers on disposing of used and expired chemicals.

### **Risks of Trypanosomiasis**

The *Trypanosomiasis* group of diseases is caused by protozoa of the genus *Trypanosoma* and affects all domestic animals. The major species affecting cattle, sheep and goats are in order of importance *T. congolense*, *T. vivax*, *T. brucei*. Most tsetse transmission is cyclical and begins when the fly ingests blood from a trypanosome-infected animal. Infected tsetse flies inoculate the trypanosome into the skin of an animal where the trypanosome grow for a few days and cause localized swellings. They enter the lymph nodes, then the bloodstream where they divide rapidly by binary fission. The immune response complexes cause inflammation, which is what contributes to the signs and lesions of the disease.

**Mitigation of Tsetse Fly Risk:** Control of *Trypanosomiasis* can be exercised at several levels, including eradication of tsetse flies and use of prophylactic drugs. Tsetse flies can be partially controlled by frequent spraying and dipping of animals, using the chemicals listed in Attachment 7. FTFE VCA will provide livestock husbandry training on prevention and control of *Trypanosomiasis*, particularly across the cattle value chain.

Alternative control measures that are outside the scope of this PERSUAP include spraying of insecticide in fly breeding area, use of insecticide-impregnated screens, and bush clearing. Animals may be given drugs prophylactically in areas with high populations of trypanosome-infected tsetse flies. Tsetse has been controlled using sequential aerosol spraying technique (SAT); ground spraying; insecticide-treated targets or insecticide-treated animals – live baits; the use of traps; and the sterile insect technique (SIT).

## ATTACHMENT I. REJECTED PESTICIDE LIST

List of Pesticides Rejected by this PERSUAP – May Not be demonstrated or promoted by the FTFF VCA (Based on April 2017 MoNAR list of Pesticides Registered in Ethiopia, October 2013 Former DACA, now VDAFACA list of Household Pesticides, and USEPA Registration Status).

No	Trade Name	Active Ingredient(s)	Reason for Rejection*
<b><i>Insecticides Originally in Table 4</i></b>			
1	Cybolt 2.5 ULV	Flucythrinate	Not USEPA-registered
2	Golan 20% SL	Acetamiprid	Proposed use on flowers not allowed due to risk of honeybee colony collapse
3	INTERCEPTER® (LN)	Alpha-cypermethrin	Not USEPA-registered for proposed mosquito control
4	Marshal 20 UL	Carbosulfan	Not USEPA-registered
5	Marshal 25% EC	Carbosulfan	Not USEPA-registered
6	Marshal 25% UVL	Carbosulfan	Not USEPA-registered
7	Marshal/Suscon	Carbosulfan	Not USEPA-registered
8	Polo 500 SC	Diafenthiuron	Not USEPA-registered
9	Rufast 75% EW	Acrinathrin	Not USEPA-registered
<b><i>Fungicides from Table 4</i></b>			
10	Delan 500 SC	Dithianon	Not USEPA-registered (only import tolerances have been established)
11	Fostonic 80 WP	Fosetyl	Not USEPA-registered
12	Score 250 EC	Difenoconazole	Proposed use on flowers not registered by USEPA; use as seed treatment is USEPA-registered
13	Systhane 20 EW	Myclobutanil	Not USEPA-registered; has only been approved for emergency exemptions
<b><i>Herbicides from Table 4</i></b>			
14	Clodinamex 10% EC	Clodinafop-propargyl + Cloquintocet-methyl	Cloquintocet-methyl not USEPA-registered
15	Gramaxone 20% EC	Paraquat	Use is highly controversial
<b><i>Acaricide from Table 4</i></b>			
16	Mitigan 18.5 EC	Dicofol	Not USEPA-registered (cancelled)
<b><i>Household Pesticides Originally in Table 6</i></b>			
17	ARS Mat (Mat)	D-Allethrin +PBO	Many products cancelled by USEPA
18	Astox (A)	Permethrin + S-biothrin	S-biothrin not USEPA-registered
19	Baygon	Propoxur 1% + Cyfluthrin 0.04% + Dichlorvos 0.5%) Aerosol	Not Registered by MoNAR (Ethiopia) – registration expired
20	Bayonet (A)	Alpha-cypermethrin + Permethrin + Propoxur + Tetramethrin	Alpha-cypermethrin not USEPA-registered for household use
21	RUBI (WP)	Alpha-cypermethrin	Alpha-cypermethrin not USEPA-registered for household use
22	Super shelltox C.I.K	Cypermethrin 0.25% + teramethrin 0.15%	Not Registered by MoNAR (Ethiopia) – registration expired
23	Super shelltox F.I.K	d-phenothrin 0.05% + teramethrin 0.25%	Not Registered by MoNAR (Ethiopia) – registration expired
<b><i>Listed RUPs Originally in Table 7</i></b>			
<b><i>Insecticides</i></b>			
24	Actara 25 WG	Thiamethoxam	Proposed use on flowers not allowed due to risk of honeybee colony collapse

No	Trade Name	Active Ingredient(s)	Reason for Rejection*
25	Confidor SL 200	Imidacloprid	Proposed use on flowers not allowed due to risk of honeybee colony collapse
26	Dynamic 400 FS	Thiram + Carbofuran	USEPA revoked all tolerances for carbofuran 12/31/09; cancellation in progress
27	Ethiosulfan 25% ULV	Endosulfan	USEPA phasing out use and production; cancellation in progress
28	Gain 20 SL	Imidacloprid	Seed treatment is the only allowed use due to risk of honeybee colony collapse
29	Gaucho 70 WS	Imidacloprid	Seed treatment is the only allowed use due to risk of honeybee colony collapse
30	Hardy	Cypermethrin 0.03% + Dichlorvos 0.99%	Not Registered by MoNAR (Ethiopia); registration expired
31	Knoxout 2 FM	Diazinon 23% W/W	Indoor uses (i.e., cockroach control) cancelled by USEPA
32	Metasystox R 250 EC	Oxydemeton-methyl	All USEPA registrations to be cancelled December 2014
33	Mitac	Amitraz	USEPA cancelled use in 2006
34	Spritex (A)	Pyrethrum + PBO	Many products cancelled by USEPA
35	Suprathion 40 EC	Methidathion	USEPA cancelled as of December 2012
36	Thiodan 25% ULV	Endosulfan	USEPA cancellation in progress
37	Thiodan 35% EC	Endosulfan	USEPA cancellation in progress
38	Thionex 25% EC/ULV	Endosulfan	USEPA cancellation in progress
39	Thionex 35% EC	Endosulfan	USEPA cancellation in progress
<b>Herbicides</b>			
40	Gesaprim 500 FW	Atrazine	Ethiopian registration expired

*\*Those pesticides flagged as not USEPA-registered or not registered in Ethiopia (as of April 2013) were rejected for either reason and both registration statuses were not verified in all cases once one lack of registration was determined as cause for rejection.*

## ATTACHMENT 2. APPROVED PESTICIDE LIST

The list of MoANR/VDAFACA (Ethiopia) and US EPA registered pesticides approved by this PERSUAP for use by FTFE VCA for demonstrations and extension is presented below:

No.	Trade Name*	Active Ingredient	Target Pest	WHO Acute Toxicity Rating (AI)	US EPA Product Toxicity Class Range†
<b>A. Insecticide</b>					
1.	Actellic 2% dust	Pirimiphos-methyl	Storage pests on cereals and pulses	II Moderately Hazardous	II Warning; III Caution
2.	Agro-Thoate 40% EC	Dimethoate 40% EC	Beanfly; aphid; thrips; African bollworm	II Moderately Hazardous	II Warning
3.	Avaunt 150 SC	S-Indoxacarb	Maize stalk borer, sweet potato butter fly, caterpillars & African bollworm	Not listed	III Caution
4.	Cruiser 350 FS	Thiamethoxam 35% FS	As seed treatment only	Not listed	III Caution
5.	Dimeto 40% EC	Dimethoate	Cow pea aphids	II Moderately Hazardous	II Warning
6.	Ethiolathion 5% Dust	Malathion	Maize weevil	III Slightly Hazardous	II Warning; III Caution
7.	Ethiothoate 40% E.C	Dimethoate	Aphids on field pea, Russian Wheat Aphid on Barley.	II Moderately Hazardous	II Warning
8.	Fyfanon 50% EC	Malathion	Armyworm, locusts and grasshoppers on cereals.	III Slightly Hazardous	II Warning; III Caution
9.	Helmathion 50 Ec	Malathion 50% EC	Aphids and leaf hoppers on maize. Storage insect pests in storage structures.	III Slightly Hazardous	II Warning; III Caution
10.	Rimon 10% EC	Novaluron	Maize stalk borer	Not listed	II Warning; III Caution
11.	Sevin 85% WP	Carbaryl	Armyworm, grasshoppers Wello bush cricket on cereals & pasture	II Moderately Hazardous	III Caution
12.	Talic 2% Dust	Pirimiphos-methyl	Storage pests (Sitophilus spp.) on stored maize.	II Moderately Hazardous	II Warning; III Caution
<b>B. Fungicide</b>					
1.	Acrobat WG	Dimethomorph + Mancozeb	Downy mildew on flowers.	U - Unlikely to be Hazardous	III Caution
2.	Agro-Laxyl MZ 63.5 WP	Mancozeb + metalaxyl	Early blight on tomato and Late blight on potato.	Slightly Hazardous	II Warning; III Caution
3.	Rova 500 FW	Chlorothalonil 50% FW	Coffee berry disease on coffee.	Not listed	I Danger; II Warning
4.	Rova 75 WP	Chlorothalonil 50% FW	Coffee berry disease on coffee.	Not listed	I Danger; II Warning
5.	Sancozeb 80% WP	Mancozeb 800 g/kg WP	Chocolate sport and rust on Faba bean.	U - Unlikely to be Hazardous	III Caution
44.	Thiram Granuflo 80 WP	Thiram 80% WP	Seed decay and damping off disease; on maize and sorghum.	III Slightly Hazardous	III Caution
<b>C. Herbicide</b>					
1.	Agro- 2,4-D amine 720g/l A.E	2,4-D 720 g/l A.E	Broadleaf weeds in wheat, barley, teff, maize and sorghum	II Moderately Hazardous	I Danger; III Caution
2.	Agro-sate 48 SC	Glyphosate 360 g/l A.E	Broad spectrum of weeds in coffee and citrus.	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
3.	Calliherbe Super	2,4-D 720 g/l A.E	Broadleaf weeds in cereal crops and sugarcane	II Moderately Hazardous	I Danger; III Caution



No.	Trade Name*	Active Ingredient	Target Pest	WHO Acute Toxicity Rating (AI)	US EPA Product Toxicity Class Range†
4.	Desormone liquid	2,4-D 720 g/l A.E	Broadleaf weeds in cereals (wheat, barley, teff, maize & sorghum)	II Moderately Hazardous	I Danger; III Caution
5.	Dicopur 720 SL	2,4-D 720 g/l A.E	Broadleaf weeds in cereal crops	II Moderately Hazardous	I Danger; III Caution
6.	Glycel 41% SL	Glyphosate 360 G/L SL	Broad leaf weeds on coffee and wasteland.	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
7.	Glyfos 360 SL	Glyphosate 36 SL	Sedges and perennial grass weeds in coffee.	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
8.	Glyphogan 480 SL	Glyphosate 480 G/L SL	Coffee weeds	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
9.	Glyphos 48% SL	Glyphosate 480G/L SL	Grass and broad leaf weeds in coffee.	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
10.	Kalach 360 SL	Glyphosate 36% SL	Perennial grasses, sedges and broad leaf weeds in coffee.	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
11.	Ken-amine 720 SL	2,4-D Amine 72% W/V SL	Post emergence broad leaved weeds in wheat.	Not listed	No information
12.	Mamba 360 SL	Glyphosate	Citrus and coffee weeds.	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
24.	Mamba Super 480 SL	Glyphosate	Grass and broad leaf weeds on coffee.	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
26.	Roundup 36 SL	Glyphosate 360 g/l	Complex weeds in coffee	U - Unlikely to be Hazardous	I Danger; II Warning; III Caution
28.	Stomp 500 E	Pendimethalin	Rooboelia weed in maize	III Slightly Hazardous	III Caution
29.	Stomp 455 CS	Pendimethalin	Rooboelia weed in maize	III Slightly Hazardous	III Caution
31.	U-46 KV fluid 72%	2,4-D 720g/l A.E	Broadleaf weeds on cereals and sugarcane.	II Moderately Hazardous	I Danger; III Caution
33.	Zura Herbicide	2,4-D 720 g/l A.E	Broad leaf weeds on maize.	II Moderately Hazardous	I Danger; III Caution

\* Note: The products identified by Trade Name are very specific and PERSUAP approval is only granted for the exact Trade Names identified in this table. Other products with similar Trade Names may not be registered in Ethiopia per the April 2017 list of registered pesticides.

† US EPA Classification: I. Highly toxic; II. Moderately toxic; III. Slightly toxic.



## ATTACHMENT 3. APPROVED PESTICIDE LIST, NON-RUPS

The list of MoANR/VDAFACA (Ethiopia) and US EPA registered pesticides that are not RUPs for the listed target pests that are approved by this PERSUAP for demonstration by FTFE VCA technician and promotion to activity clients and beneficiaries (Other uses may confer RUP status) is presented below.

No.	Trade Name	Active Ingredient	Target Pest
<b>Insecticide</b>			
1.	Deltacal 0.2DP	Deltamethrin 0.2%DP	Maize weevil on stored maize
2.	Diazinon 10%G	Diazinon	Stalk borers on maize and sorghum
3.	Diazinon 60% EC	Diazinon	Armyworm on cereals
4.	Diazol 10G	Diazinon	Stalk borer on maize and sorghum
5.	Diazol 60 EC	Diazinon 60% EC	Pests of cereals, vegetables and oil seeds.
6.	Ethiodemethrin 2.5% WDP	Deltamethrin 25 gm/l	Maize stock borer ( <i>Buseolla fusca</i> ) on maize.
7.	Ethiozinon 60% EC	Diazinon	Maize stalk borer and sweet potato
8.	Profit 72% EC	Profenofos	Pea aphids ( <i>Acyrtosiphon pisum</i> ) on field pea.
9.	Pyriban 48% EC	Chlorpyrifos	African boll worm in cotton.
10.	Selecron 720 EC	Profenofos "Q" 720g/l	Maize stalk borer on maize

Most of the requested pesticides are WHO Class III, with some EPA Class II and III. Several of these have, however, the potential to contaminate ground water, kill bees, fish, birds, aquatic organisms and other non- target organisms. Therefore, farmers need to be trained about the potential risks of each product they use.

## ATTACHMENT 4. SELECTED PESTICES IN PROGRAMATIC PERSUAP FOR FALL ARMYWORM CONTROL IN SUB-SAHARAN AFRICA

Active Ingredient/ Chemical & Trade Name	Toxicity EPA (signal word) [WHO]	Pre-harvest Interval (# of days after last pesticide application)	Acute/Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Other Comments/ Crops
Abamectin Trade name: Abba	EPA: II (Warning), GUP, RUP  [WHO: Not listed]	28	May cause slight to moderate eye and skin irritation. Not readily absorbed through the skin	Highly toxic to crustaceans and bees. Low toxicity to fish	Very low potential for groundwater contamination	Abamectin is a natural fermentation product of a soil bacterium <i>Streptomyces avermitilis</i> . It is an Insecticide/ miticide/ acaricide with stomach and contact mode of action. It is used to control insect and mite pests of a range of agronomic, fruit, vegetable and ornamental crops.
Acetamiprid Trade name: Gazelle	EPA: III (Caution)  [WHO: Not listed]	7	Harmful if swallowed. Inhaled or absorbed through skin. Causes moderate eye irritation. Not likely a carcinogen.	Extremely toxic to fish and aquatic invertebrates. highly toxic to bees		Systemic insecticide with translaminar activity and with contact and stomach action. Neonicotinoid.
Acetamiprid + lambda- cyhalothrin	EPA: II (Warning), GUP, RUP  [WHO: Not listed]	21	May cause slight irritation of the eye and skin. Could cause gastrointestinal disorders if swallowed.	Highly toxic to aquatic organisms	Unknown	
<i>Bacillus thuringiensis (Bt) var. kurstaki</i>  Trade Name: Thuricide	EPA: III(Caution) GUP  [WHO: Not acute hazard]	0	Practically nontoxic, could cause	Selective for caterpillars only, not toxic to other organisms	None	A bacterium selectively toxic to many moth and butterfly larvae (caterpillars). Insects stop feeding and die within 2 – 3 days of ingestion. This product may be applied up to the day of harvest.
Bifenthrin  Trade name: Capture	EPA: II (Warning), RUP  [WHO: Moderately hazardous]	40	Fatal if swallowed. Harmful if inhaled or absorbed through skin. Causes moderate eye irritation. May be a	Extremely toxic to fish and aquatic invertebrates. Highly toxic to bees. Do not apply this product or allow to	Little impact on aquatic systems under field conditions.	Also registered for use on cotton, citrus, ornamentals and vegetables. It is a member of the pyrethroid class with contact and stomach action. It acts on the nervous system of insects, disturbs the function of

Active Ingredient/ Chemical & Trade Name	Toxicity EPA (signal word) [WHO]	Pre-harvest Interval (# of days after last pesticide application)	Acute/Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Other Comments/ Crops
			possible carcinogen.	drift to blooming crops if bees are visiting the treatment area.		neuron by interaction with sodium channels.
<i>Beauveria bassiana</i>	EPA: III (Caution) GUP  [WHO: Not acute hazard]	0	Causes moderate eye irritation. Harmful if absorbed through the skin, inhaled or swallowed. May produce an allergic reaction.	May be toxic to bees, fish and aquatic organisms. Potentially pathogenic to honey bees.	No potential for groundwater contamination.	<i>Beauveria bassiana</i> is a naturally occurring fungal insecticide that is commonly found in soils worldwide and is used as a pesticide for controlling many kinds of insects. Also registered for use on potatoes, peppers, and eggplants, ornamentals, fruits, turf.
Carbaryl  Trade name: Sevin	EPA: II (Warning), GUP  [WHO: Moderately hazardous]	48	Harmful if swallowed, inhaled or absorbed through skin. Overexposure can result in convulsions, coma, and death. Likely to be carcinogenic in humans.	Extremely toxic to estuarine and aquatic invertebrates, highly toxic to bees. Do not apply this product or allow to drift to blooming crops if bees are visiting the treatment area.	Potential ground water contaminant.	Also registered for use on cotton, citrus, ornamentals and vegetables. It is a member of the carbamate class with contact and stomach action and slight systemic properties.
chlorantraniliprole	EPA: III (Caution) GUP  [WHO: Not acute hazard]	21	Not a possible carcinogen.	Toxic to aquatic invertebrates, oysters and shrimp.	Potential ground water contaminant.	Also registered for use on cotton, citrus, ornamentals and vegetables. It acts primarily through ingestion and also through contact. Affected insects rapidly stop feeding, general lethargy, paralysis and ultimate death.
chlorantraniliprole + lambda-cyhalothrin  Trade name: Besiege	EPA: III (Caution) GUP  [WHO: Not listed]	21	Fatal if swallowed. Harmful if absorbed through skin. Causes moderate eye irritation, may cause allergic skin reactions. Not a possible carcinogen.	Extremely toxic to fish, aquatic invertebrates and wildlife. Highly toxic to bees. Do not apply this product or allow drifting to blooming crops if bees are visiting the treatment area.	Potential ground water contaminant.	Also registered for use on canola, vegetables. cereal crops. Broad spectrum Insecticide providing both rapid knockdown and long lasting residual control of lepidopteran, sucking and chewing insect pests. It has dual modes of action and provides control by contact, ingestion and ovicidal action.
beta-cyfluthrin	EPA: II, III (Warning, Caution) RUP, GUP	21	Harmful if swallowed, inhaled or absorbed	Extremely toxic to fish and aquatic	Potential ground water	Also registered for use on cotton, citrus, ornamentals and vegetables. It

Active Ingredient/ Chemical & Trade Name	Toxicity EPA (signal word) [WHO]	Pre-harvest Interval (# of days after last pesticide application)	Acute/Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Other Comments/ Crops
Trade name: Baythroid	[WHO: Not listed]		through skin. Causes substantial but temporary eye injury. May be a possible carcinogen	invertebrates. Highly toxic to bees. Do not apply this product or allow to drift to blooming crops if bees are visiting the treatment area.	contaminant.	is a non systemic insecticide with contact and stomach action. it causes rapid knock down and has long residual activity. It acts on the nervous system of insects, disturbs the function of neuron by interaction with sodium channels.
<i>gamma</i> -cyhalothrin  Trade name: Proaxis	EPA: II, III (Warning, Caution) RUP, GUP  [WHO: Not listed]	21	Harmful if swallowed, inhaled or absorbed through skin. Causes moderate eye irritation. May be a possible carcinogen.	Extremely toxic to fish and aquatic invertebrates and wildlife. Highly toxic to bees. Do not apply this product or allow to drift to blooming crops if bees are visiting the treatment area.	Potential ground water contaminant.	Also registered for use on some row crops and vegetables. It is a non-systemic insecticide with contact and stomach mode of action. It acts on the nervous system of insects, disturbs the function of neuron by interaction with sodium channels. Pyrethroid.
<i>lambda</i> -cyhalothrin  Trade name: Warrior II	EPA: II, III (Warning, Caution) RUP  [WHO: Not acute hazard]	30	Harmful if swallowed, inhaled or absorbed through skin. Causes moderate eye irritation. Avoid contact with eyes and breathing spray mist May be a possible carcinogen.	Toxic to aquatic invertebrates, oysters and shrimp. Highly toxic to bees. Do not apply this product or allow to drift to blooming crops if bees are visiting the treatment area.	Potential ground water contaminant.	Also registered for use cotton, ornamentals and vegetables. It is a non-systemic insecticide with contact and stomach mode of action and repellent properties. It acts on the nervous system of insects, disturbs the function of neuron by interaction with sodium channels. it gives rapid knock down and has long residual activity.
<i>zeta</i> -cypermethrin  Trade name: Respect	EPA: II, III (Warning, Caution) RUP,  [WHO: Not acute hazard]	30	Harmful if swallowed, inhaled or absorbed through skin. Causes moderate eye irritation. Avoid contact with eyes and breathing spray mist May be a possible carcinogen.	Toxic to aquatic invertebrates, oysters and shrimp. Highly toxic to bees. Do not apply this product or allow to drift to blooming crops if bees are visiting the treatment area.	Potential groundwater contaminant.	Also registered for use on cotton, citrus, ornamentals and vegetables. It is a member of the pyrethroid class with contact and stomach action. It acts on the nervous system of insects, disturbs the function of neuron by interaction with sodium channels.
dimethoate	EPA: II (Warning)	15	Moderate to severe skin irritation. Severe	Slightly toxic to fish, HT to amphibians and	Potential groundwater	Systemic insecticide and acaricide with contact and stomach action. It is

Active Ingredient/ Chemical & Trade Name	Toxicity EPA (signal word) [WHO]	Pre-harvest Interval (# of days after last pesticide application)	Acute/Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Other Comments/ Crops
Trade name: Dimethoate	[WHO: Moderately hazardous]		irritation of eyes.	crustaceans and VHT to bees	contaminant	a cholinesterase inhibitor.
imidacloprid  Trade name: Admire Pro imidacloprid Trade name: Admire Pro	EPA: II, III (Warning, Caution) RUP, GUP  [WHO: Not acute hazard]	0	Harmful if swallowed or absorbed through skin. not listed as carcinogen; unknown as dev/reproductive toxin	Not acutely toxic to fish; extremely toxic to insects, and honeybees, expressed in pollen and nectar	Potential groundwater contaminant	It is a systemic insecticide with translaminar activity and with stomach and contact action. It can be applied as soil, seed and foliar treatment for the control of sucking insects as well as soil insects. <b>Avoid flowering crops in bloom!</b>
indoxacarb acetamiprid	EPA: III (Caution)  [WHO: Not acute hazard]	21	It may cause mild eye irritation with tearing, & blurred vision. May cause skin sensitization with allergic rashes. Not likely a carcinogen.	Moderately toxic to bees. Highly toxic to fish and crustaceans.	No data found	It is a contact poison. Affected insects stop feeding with poor coordination and paralysis and ultimate death. Effective against lepidopteran pests of cotton, vegetable and fruits.
<i>Metarrhizium anisopliae</i>	EPA: III (Caution)  [WHO: Not acute hazard]	0	Harmful if swallowed, inhaled or absorbed through skin. Causes moderate eye irritation. No expected long-term risks.	No major threats to nontarget ecosystems	May be a potential groundwater contamination.	Also registered for use on potatoes, peppers, and eggplants. <i>Metarrhizium anisopliae</i> is a natural biopesticide based on the naturally occurring fungus. It is effective against a variety of pests. It should be applied when the temperature is between 18- 28°C/65-82°F and the relative humidity is approximately 80%.
Malathion  Trade name: Malathion	EPA: II (Warning)  [WHO: Slightly hazardous]	7	Harmful if swallowed or absorbed through skin. Causes substantial but temporary eye injury. Not likely a carcinogen and mutagen.	It is toxic to aquatic organisms, including fish and invertebrates. Highly toxic to bees. Do not apply this product or allow drift in to blooming crops if bees are visiting the treatment area.	Potential groundwater contaminant	Non-systemic insecticide and acaricide with contact and stomach and respiratory action. Used on potatoes, vegetables, cotton and rice.
Methoxyfenozide  Trade name:	EPA: III (Caution)	21	Harmful if absorbed through skin. Avoid contact with eyes and	May be hazardous to aquatic invertebrates.	Potential groundwater contaminant.	It belongs to the diacylhydrazine class and mimics the action of molting hormone of lepidopteran

Active Ingredient/ Chemical & Trade Name	Toxicity EPA (signal word) [WHO]	Pre-harvest Interval (# of days after last pesticide application)	Acute/Chronic Toxicity	Eco-toxicity	Groundwater Contamination Potential	Other Comments/ Crops
Intrepid	[WHO: Not acute hazard]		skin or clothing. Avoid breathing spray mist.			insects. It is an ecdysone agonist, caused cessation of feeding and lethal premature molt. Complete mortality of insect may take several days but the affected larvae becomes lethargic. It does not have any systemic properties.
Permethrin  Trade name: Ambush	EPA: III (Caution)  [WHO: Moderately hazardous]	30	Harmful if swallowed, inhaled or absorbed through skin. Causes skin irritation. May be a possible carcinogen. Avoid contact with eyes and breathing spray mist	Extremely toxic to fish and aquatic invertebrates. Highly toxic to bees. Do not apply this product or allow to drift to blooming crops if bees are visiting the treatment area.	Potential groundwater contaminant.	Also registered for use on cotton, citrus, ornamentals and vegetables. It is a non-systemic insecticide with contact and stomach action and some repellent properties. It acts on the nervous system of insects, disturbs the function of neuron by interaction with sodium channels
Spinetoram (Delegate)  Trade name: Delegate	EPA: III (Caution)  [WHO: Not acute hazard]	I	Causes Moderate Eye Irritation. Avoid contact with eyes or clothing. May be a possible carcinogen.	This product is toxic to bees exposed to treatment during the 3 hours following treatment. This product is toxic to aquatic invertebrates.	Potential groundwater contaminant.	Also registered for use on cotton, citrus, ornamentals and vegetables. Fermentation product of <i>Saccharopolyspora spinosa</i> , and an analogue of spinosad. It acts as contact and stomach poison and causes paralysis. [Fermentation product of <i>Saccharopolyspora spinosa</i> , and an analogue of spinosad, a spinosyn]
Spinosad  Trade name: Success	EPA: III (Caution)  [WHO: Not acute hazard]	I	May cause slight irritation to eyes	Slightly toxic to earthworms, mod. toxic to fish, highly toxic to bees.	Very low potential for ground water contamination	Spinetoram is toxicologically identical to spinosad

### **Biologicals for Fall army worm control:**

Fall Armyworm Lure (*Spodoptera frugiperda*) is a pheromone insect lure for attracting target insects. This pheromone lure is manufactured with high purity pheromones according to recommendations from the research community and are formulated to meet, or exceed, industry standards.

The pheromone lures are non-toxic where each lure has a species-specific pheromone, a scent that female insects produce to attract males. The following pheromone insect lures are recommended for use

- HELIOTHIS PHEROMONE TRAPS,
- SPODOPTERA FRUGIPERDA PHEROMONE LURES and
- HERCON VAPOSTRIPS (insect attractant & trap).



## ATTACHMENT 5: PESTICIDES REGISTERED IN ETHIOPIA BY MOANR (APRIL 2017)

### INSECTICIDES

No	Trade Name	Common Name	Approved uses
1	Actellic 2% dust	pirimiphos-methyl	For the control of storage pests on cereals and pulses.
2	Akito 2.5% EC	beta cypermethrin	For the control of stalk borer on Maize
3	Alphos 56% Tab.	aluminium phosphide 560 gm/kg	Insecticide (Fumigant) for the control of maize weevil on maize.
4	Avaunt 150 SC	Indoxacarb	For the control of stalk borer on maize, sweet potato butter fly on sweet potato, caterpillars on flowers & African boll worm on cotton.
5	Carba 85% WP	carbaryl	For the control of stem borer on maize.
6	Celphos	aluminium phosphide 56% tablet	for the control of maize weevil (sitophilus spp) and flour beetle (Tribolium spp) on stored maize.
7	Datrate 5% EC	Lambda- Cyhalothrin	For the control of Maize Stalk Borer (Chilo Partellus) on Maize.
8	Degesch Plates/Strips	magnesium Phosphide 56%	For the control of maize weevil on maize grain/seeds.
9	Delicia	aluminium phosphide 56.7%	For the control of storage pests on cereals and pulses.
10	Deltacal 0.2DP	deltamethrin 0.2%DP	For the control of maize weevil on stored maize.
11	Deltarin 25 EC	Deltamethrin	For the control of African bollworm on chickpea.
12	Detia Gas-Ex-T	aluminium phosphide 56.7%	For the control of storage weevils and beetles on cereals and pulses.
13	Devicyprin 25	cypermethrin	For the control of stalk borer on maize.
14	Diazinon 10% G	Diazinon	For the control of stalk borers on maize and sorghum.
15	Diazinon 60% EC	Diazinon	For the control of armyworm on cereals.
16	Diazol 10G	Diazinon	For the control of stalk borer on maize and sorghum
17	Diazol 60 EC	diazinon 60% EC	For the control of pests of cereals, vegetables and oil crop & aphids, caterpillars, whiteflies, nematodes, termites & cutworms on flowers.
18	Dursban 240 ULV*	chlorpyrifos-ethyl	For the control of armyworm, locusts and grasshoppers on cereals and pastures.
19	Dursban 48% EC*	chlorpyrifos-ethyl	For the control of armyworm, locusts and grasshoppers on cereals and pastures & to control termites.
20	Dynamic 400 FS	thiram + Carbofuran	For the control of snout beetle on maize.
21	Ethiodemethrin 2.5% WDP	deltamethrin 25 gm/lit	For the control of maize stock borer (Buseolla fusca) on maize.
22	Dursban 240 ULV*	chlorpyrifos-ethyl	For the control of armyworm, locusts and grasshoppers on cereals and pastures.
23	Dursban 48% EC*	chlorpyrifos-ethyl	For the control of armyworm, locusts and grasshoppers on cereals and pastures & to control termites.
24	Dynamic 400 FS	thiram + Carbofuran	For the control of snout beetle on maize.
25	Ethiodemethrin 2.5% WDP	deltamethrin 25 gm/lit	For the control of maize stock borer (Buseolla fusca) on maize.
26	Ethiolathion 5% Dust	Malathion	For the control of maize Weevil (Sitophilus zeamays) on stored maize.
27	Ethiopyrifos 48% EC	Chlorpyrifos	For the control of termite in Maize.
28	Ethiotrothion 50% EC	Fenitrothion	For the control of sweet potato butterfly (Acraea acerata) on sweet potato.
29	Ethiozinon 60% EC	Diazinon	For the control of maize stalk borer (Busseola fusca) and sweet potato butterfly (Acraea acerata) on maize and sweet potato respectively & black beetle (Heteroychus

			Licas) & termite on sugar cane.
30	Farrate	lambda -Cyhalothrin	For the control of African bollworm ( <i>Heliothis Armigera</i> ) on Chickpea.
31	Fullongphos	aluminium phosphide	For the control of maize weevil and other storage pests on stored maize.
32	Fyfanon 50% EC*	Malathion	For the control of armyworm, locusts and grasshoppers on cereals.
33	Gastoxin	aluminium phosphide 57% tablet	For the control of maize weevil and other storage pests on stored maize.
34	Helmathion 50 Ec	malathion 50% EC	For the control of Aphids and leaf hoppers on maize. For the control of storage insect pests in storage structures.
35	Highway 50 EC	lambda-cyhalothrin	For the control of African boll worm on chick pea
36	liathion	Malathion	For the control of Maize Stalk Borer on Maize.
37	Kill-phose	aluminium phosphide	For the control of storage insect pests specially <i>Sitophilus</i> spp. & <i>Tribolium</i> spp. In stored maize grain.
38	Lambdahock 5% EC	lambda-cyhalotrin	For the control of maize stock borer on maize.
39	Lamdex 5% EC	lambda-cyhalothrin 5% EC	For the control of maize stalk borer ( <i>Busseola fusca</i> Fuller) on maize and aphids, thrips, Leafhoppers, caterpillars & leaf minors on flowers.
40	Litphos 56 TB	aluminium Phosphide 56%	For the control of maize weevil in maize store.
41	Mogphos 56% Tablet	aluminium phosphide	For the control of maize weevil in stored maize.
42	Modan 5% EC	lambda –cyhalothrin 5% EC	For the control of maize stalk borer in maize.
43	Helmathion 50 Ec	malathion 50% EC	For the control of Aphids and leaf hoppers on maize. For the control of storage insect pests in storage structures.
44	Highway 50 EC	lambda-cyhalothrin	For the control of African boll worm on chick pea
45	liathion	Malathion	For the control of Maize Stalk Borer on Maize.
46	Kill-phose	aluminium phosphide	For the control of storage insect pests specially <i>Sitophilus</i> spp. & <i>Tribolium</i> spp. In stored maize grain.
47	Lambdahock 5% EC	lambda-cyhalotrin	For the control of maize stock borer on maize.
48	Lamdex 5% EC	lambda-cyhalothrin 5% EC	For the control of maize stalk borer ( <i>Busseola fusca</i> Fuller) on maize and aphids, thrips, Leafhoppers, caterpillars & leaf minors on flowers.
49	Litphos 56 TB	aluminium Phosphide 56%	For the control of maize weevil in maize store.
50	Mogphos 56% Tablet	aluminium phosphide	For the control of maize weevil in stored maize.
51	Modan 5% EC	lambda –cyhalothrin 5% EC	For the control of maize stalk borer in maize.
52	Phostoxin	aluminium phosphide	For the control of storage pests in warehouses.
53	Proven 44 EC	Profenofos + cypermethrin	For the control of maize stalk borer on maize
54	Pyrinex 24 ULV	chlorpyrifos-ethyl	For the control of armyworm on cereal and pasture.
55	Pyrinex 48% EC	chlorpyrifos-ethyl	For the control of armyworm on cereals and pasture.
56	Quickphos	aluminium phosphide	For the control of storage pests.
57	Rimon 10% EC	Novaluron	Insect Growth Regulator (IGR) to control stalk borer on maize
58	SD-Toxin Tablet	aluminium Phosphide 56.8%	For the control of storage insect pests on maize.
59	Sevin 85% WP*	Carbaryl	For the control of armyworm, grasshoppers Wellobush cricket on cereals & pasture.
60	Shenphos 57% Tablet	aluminium Phosphide	For the control of maize weevil ( <i>Sitophilus</i> spp.) & flour beetle ( <i>Tribolium</i> spp.) on stored maize.
61	Talic 2% Dust	pirimiphos-methyl	For the control of storage pests ( <i>Sitophilus</i> spp.) on stored maize.
62	Tanphos 56% TAB	aluminium-phosphide	For the control of weevils ( <i>Sitophilus</i> Spp. And <i>Tribolium</i> Spp.) on stored maize grain.
63	Thiodan 25% ULV	Endosulfan	For the control of bollworm on cotton, maize and

			sorghum.
64	Thiodan 35% EC	Endosulfan	For the control of African bollworm on cotton, maize and sorghum.
65	Thionex 25% EC/ULV	endosulfan	For the control of African bollworm on cotton, maize, sorghum & tobacco.
66	Thionex 25% ULV	Endosulfan	For the control of African bollworm on cotton, maize and sorghum.
67	Thionex 35% EC	Endosulfan	For the control of African bollworm on cotton, maize, sorghum and tobacco.
68	Zerofly storage Bag	Deltamethrin	insecticide/Deltamethrin/ incorporated polypropylene sack is for the control of grain & seeds from post-harvest storage insect pests.

## HERBICIDES

No	Trade Name	Common Name	Approved uses
1	Agro-sate 48 SC	glyphosate 360 g/l A.E	For the control of broad spectrum of weeds in coffee and citrus.
2	Agro- 2,4-D amine 720g/l A.E	2,4-D 720 g/l A.E	For the control of broadleaf weeds in wheat, barley, teff, maize and sorghum
3	Alanex 48% EC	alachlor 480 g/l	For the control of annual grass and some broadleaf weeds in maize and soybeans.
4	Alazine 350/200 SE	alachlor 350 + alazine 200	For the control of grass and some broadleaf weeds in maize
5	Auxo EC 337	tembotrion 50 g/l + bromoxynil octanoate 262 g/l	For the control of broad leaf & grass weeds in wheat and maize
6	Butrazine 48 SC	butachlor + Atrazine	For the control of annual and perennial broadleaf & grasses weeds in maize.
7	Calliherbe Super	2,4-D 720 g/l A.E	For the control of broadleaf weeds in cereal crops and sugarcane
8	Coneo	glyphosate 41% SL	For the control of grass and broad leaved weeds in coffee.
9	Cropphosate 48% SL	Glyphosate	For the control of grass and broad leaf weeds in maize
10	Dat-Phosate 41% SL	glyphosate	For the control of annual & perennial weeds in coffee
11	Desormone liquid 720 A.E.	2,4-D 720 g/l A.E	For the control of broadleaf weeds in cereals (wheat, barley, teff, maize & sorghum)
12	Derby 175 SC	flurasulam 75 G/L + flumetsulam 100 G/L	For the control of broadleaf weeds in cereals
13	Dicopur 720 SL	2,4-D 720 g/l A.E	For the control of broadleaf weeds in cereal crops
14	Gly Kill	Glyphosate	For the control of sedges, grass & broad leaf weeds in coffee fields & on waste land (Not-cropped land).
15	Glyphos 48% SL	glyphosate 480G/L	For the control of grass and broad leaf weeds in coffee.
16	Glyphos 360 SL	glyphosate 36%	For the control of sedges and perennial grass weeds in coffee.
17	Glyphogan	glyphosate 480 G/L	For the control of coffee weeds such as Cyprus spp, cynodon spp, Digitaria spp, Hydrocotyle American, Echnocloa spp, Bidens pilosa, Ageratum conyzoides, Galinsoga parviflora and conyza albida
18	Glyphogan T	glyphosate + terbutylazine	For the control of broad-leaved weeds in coffee.
19	Glyweed 48% SL	Glyphosate	For the control of grass and broad leaf weeds in coffee.
20	Glymax 48% SL (W/V)	Glyphosate	For the control of Sedges, grasses and broad leaved weeds in coffee.
21	Gramaxone 20% E	Paraquate	For the control of complex weeds in coffee plantation.
22	Herbknock	2,4-D amine Salt 720 G/L	For the control of annual & perennial broad leaf weeds on wheat.

23	Herbicide 4% SL	Glyphosate	For the control of sedges grass and broad leaf weeds in coffee.
24	IntegrityTM	saflufenacil + dimethenamid-P	For the control of grass and broad leaf weeds in maize
25	Kalach 360 SL	Glyphosate 36% SL	For the control of perennial grasses, sedges and broad leaf weeds in coffee.
26	Lasso/Atrazine 55% SC*	alachlor 35% + atrazine 20%	For the control of annual weeds in maize, soybean and sugarcane.
27	Linkosate 75.7 SG	glyphosate ammonium	For the control of annual & perennial grass & broad leaf weeds under coffee
28	Lumax 537.5 SE	mesotrione + s-metolachlor + terbutylazine	For the control of pre and early post emergency grass and broad leaf weeds on maize.
29	Mamba 360 SL	Glyphosate	For the control of citrus and coffee weeds.
30	Mamba Super 480 SL	Glyphosate	For the control of grass and broad leaf weeds in coffee.
31	Mog-Sate 480 SL	Glyphosate	For the control of perennial grass and broad leaf weeds in coffee.
32	Mustang	(XDF 6.25 G/L + 2,4-D 300 G/L) suspo-emulsion (S.E)	For the control of broadleaf weeds in cereals.
33	Pendico® 33 EC	Pendimethalin	For the control of annual grass & broad leaf weeds in maize.
34	Primagram Gold 660 SC	s-metolachlor 290 g/l + atrazine 370 g/l	For the control of broadleaf and grass weeds in maize and sugarcane.
35	Roundup 36 SL	Glyphosate 360 g/l	For the control of complex weeds in coffee
36	Roundup Turbo 450 SL	Glyphosate	For the control of annual & perennial weeds in coffee
37	StellarTM Star	Topramezone + Dicamba	For the control of grass & broad leaf weeds in maize and Sugar cane
38	Stomp® 455 CS	Pendimethalin	For the control of rottoboellia weed in maize & broad leaf and grass weeds in cotton.
39	Stomp 500 E	Pendimethalin	For the control of rottoboellia weed in maize
40	Trust-Sate 360SL	Glyphosate	For the control of annual & perennial grasses & broad leaved weeds in coffee.
41	U-46 KV fluid 72%	2,4-D 720g/l A.E	For the control of broadleaf weeds on cereals (teff, wheat, barley, maize, sorghum) and sugarcane.
42	Ultimate 500 SC	s-metolachlor + terbutylazine	For the control of annual grasses & broad leaved weeds in maize.
43	Weedall 480 SL	Glyphosate	For the control of annual broad leaf & perennial grass weeds in coffee.
44	Weed killer	2,4-D 72 Acid Equivalent	For the control of broadleaved weeds in teff and wheat
45	Zura Herbicide	2,4-D 720 g/l A.E	For the control of broad leaf weeds on maize , wheat and teff.

## FUNGICIDES

No	Trade Name	Common Name	Approved uses
1	Odeon 82.5 WDG*	Chlorothalonil	For the control of Late blight on Potato & coffee berry disease on coffee.
2	Rova 500 FW	chlorothalonil 50% FW	For the control of coffee berry disease on coffee.
3	Rova 75 WP	chlorothalonil 50% FW	For the control of coffee berry disease on coffee.
4	Thiram Granuflo 80 WP	thiram 80% WP	For the control of seed decay and damping off disease; on maize and sorghum.

## ATTACHMENT 6: TOXICITY OF PESTICIDES - USEPA AND WHO CLASSIFICATIONS

### General Toxicity

Pesticides, by necessity, are poisons, but the toxicity and hazards of different compounds vary greatly. Toxicity refers to the inherent intoxicating ability of a compound whereas hazard refers to the risk or danger of poisoning when the pesticide is used or applied. Pesticide hazard depends not only on toxicity but also on the chance of exposure to toxic amounts of the pesticide. Pesticides can enter the body through oral ingestion, through the skin or through inhalation. Once inside the body, they may produce poisoning symptoms, which are either acute (from a single exposure) or chronic (from repeated exposures or absorption of smaller amounts of toxicant).

### EPA and WHO Toxicity Classifications & Differences

Basically, there are two systems of pesticide toxicity classification. These are the US EPA and the WHO systems of classification. It is important to note that the WHO classification is based on the active ingredient only, whereas US EPA uses product formulations to determine the toxicity class of pesticides. So, WHO classification shows relative toxicities of all pesticide active (or technical) ingredients, whereas EPA classification shows actual toxicity of the formulated products, which can be more or less toxic than the active ingredient alone and are more representative of actual dangers encountered in the field. The tables below show classification of pesticides according to the two systems.

#### USEPA Classification (based on formulated product = active ingredient *plus inert and other ingredients*)

Class	Descriptive term	Mammalian LD50		Mammalian Inhalation LC50	Irritation		Aquatic invert/fish (LC50 or EC50) <sup>2</sup>	Honey bee acute oral (LD50)
		Oral	Dermal		Eye <sup>1</sup>	Skin		
I	Extremely toxic	≤ 50	≤ 200	≤ 0.2	Corrosive	Corrosive	< 0.1	
II	Highly toxic	50-500	200-2000	0.2-2.0	Severe	Severe	0.1-1.0	< 2 µg/bee
III	Moderately toxic	500-5000	2000-20000	2.0-20	No corneal opacity	Moderate	1.1-10.0	2.1-11 µg/bee
IV	Slightly toxic	≤ 5000	≤ 20000	≤ 20	None	Moderate or slight	10.1-100	
	Relatively non-toxic						101-1000	
	Practically non-toxic						1001-10,000	> 11 µg/bee
	Non-toxic						> 10,000	

<sup>1</sup> Corneal opacity not reversible within 7 days for Class I pesticides; corneal opacity reversible within 7 days but irritation persists during that period for Class II pesticides; no corneal opacity and irritation is reversible within 7 days for Class III pesticides; and Class IV pesticides cause no irritation.

<sup>2</sup> Expressed in ppm or mg/l of water.

**WHO Classification** (based only on active ingredient)

Class	Descriptive term	Oral LD <sub>50</sub> for the rat (mg/kg body wt)		Dermal LD <sub>50</sub> for the rat (mg/kg body wt)	
		Solids	Liquids	Solids	Liquids
Ia	Extremely hazardous	≤ 5	≤ 20	≤ 0	≤ 40
Ib	Highly hazardous	5-50	20-200	10-100	40-400
II	Moderately hazardous	50-500	20-2000	100-1000	400-4000
III	Slightly hazardous	≥ 501	≥ 2001	≥ 1001	≥ 4001
U	Unlikely to present acute hazard in normal use	≥ 2000	≥ 3000	-	-

## ATTACHMENT 7: LIST OF LIVESTOCK PESTICIDES: REGISTERED BY VETERINARY DRUGS AND ANIMAL FEED ADMINISTRATION AND CONTROL AUTHORITY (VDAFACA) 2017

No	Brand Name	Generic Name	Strength	Dosage Form	Presentation	Manufacturer	Country of Origin	Local Agent	Approval Date	Status
1.	Tse Tse Pour-On	Deltametrin 1%	10 MG	Pour on solution	250 ML & 1 liter	Cross Vetpharm Group LTD T/A Bimeda Chemical Export	Ireland	Welin Trading PLC	20/10/2016	Valid
2.	Ethiomireaz 12.5% EC	Amitraz	125 MG/ML	Topical liquid	1 liter	Adami-Tulu Pesticides Processing SH.CO	Ethiopia	Adami-Tulu Pesticides Processing SH.CO	14/2/2014	Valid
3.	Vetazinon 60%	Diazinon	600MG/ liter	Topical liquid		Adami-Tulu Pesticides Processing SH.CO	Ethiopia	Adami-Tulu Pesticides Processing SH.CO		Under Renewal
4.	Nobilis G + ND Clone 30	Inactivated Avian IBD Virus, Strain D78 + Inactivated ND Virus Strain Clone 30		Water-in-oil emulsion	Bottle containing 500 ML sufficient for 1000 dose or 250 ML sufficient for 500 dose	Intervet International B.V	Netherlands	Addis Vet PLC	01.01.2015	Valid
5.	Virocide	Alkyldimethylbenzyl-Ammonium Chloride 170.6 GM + Didecyldimethyl-Ammonium Chloride 78 GM + Glutaraldehyde 107.25 GM		Liquid	1 L, 5 L, 10 L, 20L, 60L, 200L, 600L, 1000L,	Clolines-Belgium	Belgium	BioTech PLC	18/05/2015	Valid
6.	Amitraz	Amitraz 12.5%	125MG	Topical solution	1 liter plastic bottle	Hebei Veyong Animal Pharmaceuticals	China	BioTech PLC	15/06/2016	Valid
7.	Diminavidium 2.36	Diminazene Diacetate 445 MG + Antipyrine 555 MG + VIT B12 + B6	445 + 555	Granules	2.36 GM sachets	Hebei Veyong Animal Pharmaceuticals	China	BioTech PLC	14/09/2016	Valid
8.	Kenotest	Sodium Lauryl Sulfate	5%	Liquid	1 L & 5 liters HDPE	CID LINES	Belgium	BioTech PLC	28/11/2016	Valid
9.	Asampro 20%	Amprolium	200 MG	Powder	5 GM, 25 GM, 100 GM & 1 KG	Ashish Life Science LTD	India	DAT	10/6/2015	Valid
10.	Ashibuta IS	Phenylbutazone	1000 MG	Powder	Sachet of 5 GM	Ashish Life Science LTD	India	DAT	19/11/14	Valid
11.	Ashoxy 20%	Oxytetracycline HCL	20 GM	Powder	Sachet of 5 GM & 100 GM	Ashish Life Science LTD	India	DAT	3/10/2014	Valid
12.	Fenacure 22%	Fenbendazole	22%	Oral Granules	Sachet of 12 GM	Ashish Life Science LTD	India	DAT	8/2/2015	Valid
13.	Fenacure 22%	Fenbendazole	22%	Oral Granules	Sachet of 12 GM	Ashish Life Science LTD	India	DAT		Under Evaluation



No	Brand Name	Generic Name	Strength	Dosage Form	Presentation	Manufacturer	Country of Origin	Local Agent	Approval Date	Status
14.	Alamycin Aerosol	OXYTETRACYCLINE HYDROCHLORIDE	3.21% W/V	Cutaneous Spray Solution	140 gm of pressurized solution in a tin can	Norbrook Laboratories Limited	Northern Ireland	Dej. A.M. Gonafar & Sons P.L.CO	6/5/2016	Valid
15.	Diazinol 60% EC	Diazinon	632 GM	Emulsifiable Concentrate	1 liter bottle	Kafer El Zayat Pesticides and Chemicals	Egypt	Dej. A.M. Gonafar & Sons P.L.CO	20/10/2008	Expired
16.	Diazinol 60% EC	Diazinon	600 GM/L	Emulsifiable Concentrate	1 liter bottle	Kafer El Zayat Pesticides and Chemicals	Egypt	Dej. A.M. Gonafar & Sons P.L.CO		Under Renewal
17.	Diazinol 60	Diazinon	600 GM/L	Emulsifiable Concentrate	1 liter bottle	Kafer El Zayat Pesticides and Chemicals	Egypt	Dej. A.M. Gonafar & Sons P.L.CO	25/8/2014	Recognized
18.	Lactaclox 275 MG	Ampicillin + Cloxacillin	75MG + 200MG	Prefilled Syringe	5 GM	Norbrook Laboratories Limited	Northern Ireland	Dej. A.M. Gonafar & Sons P.L.CO	26/07/2016	Valid
19.	Ectraz 12.5%	Amitraz 12.5%	125MG	Emulsifiable Concentrate	250ML , 1000 ML HDPE bottle	Monte Ajat Veterinary Pharmaceuticals	Saudi Arabia	EBG	20/09/2016	Valid
20.	Diazin 600	Diazinon	600 MG	Emulsifiable Concentrate	250 ML, 1000 ML co-ex bottle	Monte Ajat Veterinary Pharmaceuticals	Saudi Arabia			
21.	Acarmic	Amitraz	12.50GM	Emulsifiable Solution	1 liter bottle	Laboratories Microsules Uruguay S.A.	Uruguay			
22.										
23.										
24.										
25.										
26.										
27.										

## ATTACHMENT 8: WEBSITES, REFERENCES AND LINKS

### General

<http://www.pesticideinfo.org> (PAN most complete pesticides database)

<http://extoxnet.orst.edu/pips/ghindex.html> (Exttoxnet Oregon State database) <http://www.epa.gov/ecotox/> (EPA Ecotox Database)

<http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg> (EPA Registr.Eligib.Decisions)

<http://www.epa.gov/opprd001/rup/rupreport.pdf> (EPA restricted use pesticides)

<http://www.chemfinder.camsoft.com> (chemical database & internet search, free & fee)

<http://www.hclrss.demon.co.uk/index.html> (compendium of pesticide common names)

[http://www.agf.gov.bc.ca/pesticides/f\\_2.htm](http://www.agf.gov.bc.ca/pesticides/f_2.htm) (all types of application equipment) compendium

### **Electronic information on pesticides was collected by the consultants using several websites:**

[www.epa.gov](http://www.epa.gov) for compliance; [www.who.int/ipcs/publications/pesticides](http://www.who.int/ipcs/publications/pesticides) for WHO classification; [www.kellysolutions.com](http://www.kellysolutions.com) for formulations registration status information; [www.greenbook.net](http://www.greenbook.net) and [www.cdms.com](http://www.cdms.com) for efficacy information and Material Safety Data Sheets found on pesticide labels; as well as the PAN [www.pesticideinfo.org](http://www.pesticideinfo.org) and EXTTOXNET <http://extoxnet.orst.edu/pips/ghindex.html> websites for specific toxicological, registration and environmental data.

<http://www.foodaidmanagement.org/pdfdocs/usaiddoc/FldGuide2000TextI.PDF>

(good doc on outline of how to do environmental assessments, beyond compliance)

### **Pesticide Toxicity to Honey Bees**

<http://www.entm.purdue.edu/Entomology/ext/targets/e-series/EseriesPDF/E-53.pdf>

### **Biological Pesticides List**

<http://www.koppert.com> (a Dutch biologicals company doing business internationally)

<http://www.biobest.be> (a Belgian biologicals company doing business internationally)

### **Minimum Residue Limits for Pesticides & Veterinary Drugs in Food**

<http://faostat.fao.org/faostat/collections?version=ext&hasbulk=0&subset=FoodQuality>

### **PERSUAP Sites**

<http://www.encapafrika.org/sectors/pestmgmt.html> (PERSUAPS idance)

[http://www.watერიqc.com/millennium\\_conference/Proceedings/powerpoint\\_presentations/Day\\_4/1030rossier.pps#285](http://www.watერიqc.com/millennium_conference/Proceedings/powerpoint_presentations/Day_4/1030rossier.pps#285) Critical Pesticide Management Issues (EA History PPT)

### **International Conventions**

<http://www.pops.int/> (POPs website) [http://www.pops.int/documents/convtext/convtext\\_en.pdf](http://www.pops.int/documents/convtext/convtext_en.pdf) (POPs Convention text) <http://www.chem.unep.ch/pops/pdf/redelipops/redelipops.pdf> (reduce & eliminate POPs) **methyl-bromide site** <http://www.epa.gov/ozone/mbr/harmoniz.html>

[www.watერიqc.com/millennium\\_conference/Proceedings/powerpoint\\_presentations/Day\\_4/1030rossier.pps#285](http://www.watერიqc.com/millennium_conference/Proceedings/powerpoint_presentations/Day_4/1030rossier.pps#285) Critical Pesticide Management Issues

### **Audio-Visual IPM and SPU Resources**

<http://entweb.clemson.edu/pesticid/publictn/resource.htm>

Existing bilateral, regional or DCHA Agricultural, Economic Growth, Feed the Future Sector and DCHA Food for Peace PERSUAPs in sub-Saharan Africa, valid in 2017, and relevant to the Fall Armyworm – FAW (*Spodoptera frugiperda*) management sites

- Ethiopia Agribusiness and Trade Expansion (ATEP) PERSUAP:  
[http://gemini.info.usaid.gov/repository/pdf/4718\\_1.pdf](http://gemini.info.usaid.gov/repository/pdf/4718_1.pdf)
- Agricultural Growth Program- Agribusiness and Market Development (AGP-AMDE):  
[http://gemini.info.usaid.gov/repository/pdf/4001\\_3.pdf](http://gemini.info.usaid.gov/repository/pdf/4001_3.pdf)
- Ethiopia Commercial Farm Service Program (CFSP):  
[http://gemini.info.usaid.gov/repository/pdf/4001\\_8.pdf](http://gemini.info.usaid.gov/repository/pdf/4001_8.pdf)
- Productive Safety Net Program (PSNP) Title II Development Food Assistance Food Assistance Program (DFAP): <http://gemini.info.usaid.gov/repository/pdf/42326.pdf>